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A
HISTORY OF MAGIC AND EXPERIMENTAL SCIENCE

VOLUME II

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A
HISTORY OF MAGIC AND EXPERIMENTAL SCIENCE

DURING THE FIRST THIRTEEN CENTURIES OF OUR ERA

BY

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VOLUME II

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CHAPTER XXXV

THE EARLY SCHOLASTICS: PETER ABELARD AND HUGH OF ST. VICTOR

Relation of scholastic theology to our theme—Character of Abelard's learning—Incorrect statements of his views—The nature of the stars—Prediction of natural and contingent events—The Magi and the star—Demons and forces in nature—Magic and natural science—Hugh of St. Victor—Character of the *Didascalicon*—Meaning of *Physica*—The study of history—The two mathematics: astrology, natural and superstitious—The superlunar and sublunar worlds—Discussion of magic—Five sub-divisions of magic—*De bestiis et aliis rebus.*

Relation of scholastic theology to our theme.

THE names of Peter Abelard, 1079-1142, and Hugh or Hugo of St. Victor, 1096-1141, have been coupled as those of the two men who perhaps more than any others were the founders of scholastic theology. Our investigation is not very closely or directly concerned with scholastic theology, which I hope to show did not so exclusively absorb the intellectual energy of the twelfth and thirteenth centuries as has sometimes been asserted. Our attention will be mainly devoted as heretofore to the pursuit of natural science during that period and the prominence both of experimental method and of magic in the same. But our investigation deals not only with magic and experimental science, but with their relation to Christian thought. It is therefore with interest that we turn to the works of these two early representatives of scholastic theology, and inquire what cognizance, if any, they take of the subjects in which we are especially interested. As we proceed into the later twelfth and thirteenth centuries in subsequent chapters, we shall also take occasion to note the utterances of other leading men of learning who speak largely from the theological standpoint, like John of Salisbury and Thomas Aquinas. Let us hasten to admit also that the scholastic method of instruction and writing made itself felt in natural science and medicine as well as in theology, as a number of our subsequent chapters will illustrate. In the present chapter we shall furthermore be brought again into contact with the topic of the *Physiologus* and Latin Bestiaries, owing to the fact that a treatise of this sort has been ascribed, although probably incorrectly, to Hugh of St. Victor.

Character of Abelard's learning.

There is no more familiar, and possibly no more important, figure in the history of Latin learning during the twelfth century than Peter Abelard who flourished at its beginning. His career, as set forth in his own words, illustrates educational conditions in Gaul at that time. His brilliant success as a lecturer on logic and theology at Paris reveals the great medieval university of that city in embryo. His pioneer work, *Sic et Non,* set the fashion for the standard method of presentation employed in scholasticism. He was not, however, the only daring and original spirit of his time; his learned writings were almost entirely in those fields known as patristic and scholastic; and, as in the case of *Sic et Non,* consist chiefly in a repetition of the utterances of the fathers. This is especially true of his statements concerning astrology, the *magi,* and demons. To natural science he gave little or no attention. Nevertheless his intellectual prominence and future influence make it advisable to note what position he took upon these points.

Incorrect statements of his views.

Although not original, his views concerning the stars and their influences are the more essential to expose, because writers upon Abelard have misunderstood and consequently misinterpreted them. Joseph McCabe in his Life of Abelard,[1] for instance, asserts that Abelard calls mathematics diabolical in one of his works. And Charles Jourdain in his in some ways excellent [2] *Dissertation sur l'état de la philosophie naturelle en occident et principalement en France pendant la première moitié du XIIe siècle,* praises Abelard for what he regards as an admirable attack upon and criticism of astrology in his *Expositio in Hexameron,* saying, "It will be hard to find in the writers of a later age anything more discriminating on the errors of astrology." [1] Jourdain apparently did not realize the extent to which Abelard was simply repeating the writers of an earlier age. However, Abelard's presentation possesses a certain freshness and perhaps contains some original observations.

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[1] J. McCabe, *Peter Abelard,* New York, 1901.

[2] Especially considering its date, Paris, 1838.

The nature of the stars.

In the passage in question [2] Abelard first discusses the nature of the stars. He says that it is no small question whether the planets are animated, as the philosophers think, and have spirits who control their motion, or whether they hold their unvarying course merely by the will and order of God. Philosophers do not hesitate to declare them rational, immortal, and impassive animals, and the Platonists call them not only gods but gods of gods, as being more excellent and having greater efficacy than the other stars. Moreover, Augustine says in his *Handbook* that he is uncertain whether to class the sun, moon, and stars with the angels. In his *Retractions* Augustine withdrew his earlier statement that this world is an animal, as Plato and other philosophers believe, not because he was sure it was false, but because he could not certainly prove it true either by reason or by the authority of divine scripture. Abelard does not venture to state an opinion of his own, but he at least has done little to refute a view of the nature of the heavenly bodies which is quite favorable to, and usually was accompanied by, astrology. Also he displays the wonted medieval respect for the opinions of the philosophers in general and the leaning of the twelfth century toward Plato in particular.

Prediction of natural and contingent events.

Abelard next comes to the problem of the influence of the stars upon this earth and man. He grants that the stars control heat and cold, drought and moisture; he accepts the astrological division of the heavens into houses, in certain ones of which each planet exerts its maximum of force; and he believes that men skilled in knowledge of the stars can by astronomy predict much concerning the future of things having natural causes. Astronomical observations to his mind are very valuable not only in agriculture but in medicine, and he mentions that Moses himself is believed to have been very skilful in this science of the Egyptians. It is only to the attempt to predict *contingentia* as distinguished from *naturalia* that he objects. By *contingentia* he seems to mean events in which chance and divine providence or human choice and free will are involved. He gives as a proof that astrologers cannot predict such events the fact that, while they will foretell to you what other persons will do, they refuse to tell you openly which of two courses you yourself will pursue for fear that you may prove them wrong by wilfully doing the contrary to what they predict. Or, if an astrologer is able to predict such "contingent events," it must be because the devil has assisted him, and hence Abelard declares that he who promises anyone certitude concerning "contingent happenings" by means of "astronomy" is to be considered not so much *astronomicus* as *diabolicus*. This is the nearest approach that I have been able to find in Abelard's writings to McCabe's assertion that he once called mathematics diabolical. But possibly I have overlooked some other passage where Abelard calls *mathematica*, in the sense of divination, diabolical.[1] In any case Abelard rejects astrology only in part and accepts it with certain qualifications. His attitude is about the average one of his own time and of ages preceding and following.

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[1] *Ibid.,* p. 119.

[2] Cousin, *Opera hactenus seorsim edita* (1849-1859), I, 647-9.

The Magi and the star.

Abelard speaks of the Magi and the star of Bethlehem in a sermon for Epiphany.[2] This familiar theme, as we have seen, had often occupied the pens of the church fathers, so that Abelard has nothing new to say. On the contrary, he exhausts neither the authorities nor the subject in the passages which he selects for repetition. His first point is that the Magi were fittingly the first of the Gentiles to become Christian converts because they before had been the masters of the greatest error, condemned by law with soothsayers to death, and indebted for their "nefarious and execrable doctrine" to demons. In short, Abelard identifies them with magicians and takes that word in the worst sense. He is aware, however, that some identify them not with sorcerers *(malefici)* but with astronomers. He repeats the legend from the spurious homily of Chrysostom which we have already recounted [1] of how the magi had for generations watched for the star, warned by the writing of Seth which they possessed, and how the star finally appeared in the form of a little child with a cross above it and spake with them. He also states that they were called *magici* in their tongue because they glorified God in silence, without appearing to note that this is contrary to his previous use of *magi* in an evil sense. Abelard believes that a new star announced the birth of Christ, the heavenly king, although he grants that comets, which we read of as announcing the deaths of earthly sovereigns, are not new stars. He also discusses without satisfactory results the question why this new star was seen only by the Magi.

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[1] I have, however, searched for such in vain.

[2] Migne, PL 178, 409-17.

Demons and forces in nature.

In a chapter "On the Suggestions of Demons" in his *Ethica seu Scito te ipsum*,[2] Abelard attempts to a certain extent a natural explanation of the tempting of men by demons and the arousing of lust and other evil passions within us. In this he perhaps makes his closest approach to the standpoint of natural science, although he is simply repeating an idea found already in Augustine and other church fathers. In plants and seeds and trees and stones, Abelard explains, there reside many forces adapted to arouse or calm our passions. The demons, owing to their subtle ingenuity and their long experience with the natures of things, are acquainted with all these occult properties and make use of them for their own evil ends. Thus they sometimes, by divine permission, send men into trances or give remedies to those making supplications to them, "and often when such cease to feel pain, they are believed to be cured." Abelard also mentions the marvels which the demons worked in Egypt in opposition to Moses by means of Pharaoh's magicians.

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[1] See above, chapter 20, page 474.

[2] Cap. 4, in Migne, PL 178, 647.

Magic and natural science.

Evidently then Abelard believes both in the existence of demons and of occult virtues in nature by which marvels may be worked. Magic avails itself both of demonic and natural forces. The demons are more thoroughly acquainted with the secrets of nature than are men. But this does not prove that scientific research is necessarily diabolical or that anyone devoting himself to investigation of nature is giving himself over to demons. The inevitable conclusion is rather that if men will practice the same long experimentation and will exercise the same "subtle ingenuity" as the demons have, there is nothing to prevent them, too, from becoming at last thoroughly acquainted with the natural powers of things. Also magic, since it avails itself of natural forces, is akin to natural science, while natural science may hope some day to rival both the knowledge of the demons and the marvels of magic. Abelard does not go on to draw any of these conclusions, but other medieval writers were to do so before very long.

Hugh of St. Victor.

Upon Hugh of St. Victor Vincent of Beauvais in the century following looked back as "illustrious in religion and knowledge of literature" and as "second to no one of his time in skill in the seven liberal arts."[1] Hugh was Abelard's younger contemporary, born almost twenty years later in Saxony in 1096 but dying a year before Abelard in 1141. His uncle, the bishop of Halberstadt, had preceded him at Paris as a student under William of Champeaux. When Hugh, as an Augustinian canon, reached the monastery of St. Victor at Paris, William had ceased to teach and become a bishop. Hugh was himself chosen head of the school in 1133. He is famous as a mystic, but also composed exegetical and dogmatic works, and is noted for his classification of the sciences. Edward Myers well observes in this connection: "Historians of philosophy are now coming to see that it betrays a lack of psychological imagination to be unable to figure the subjective coexistence of Aristotelian dialectics with mysticism of the Victorine or Bernardine type —and even their compenetration. Speculative thought was not, and could not be, isolated from religious life lived with such intensity as it was in the middle ages, when that speculative thought was active everywhere, in every profession, in every degree of the social scale."[1] Later, in the case of St. Hildegard of Bingen, we shall meet an even more striking combination of mysticism and natural science.

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[1] *Speculum doctrinale* (1472?), XVIII, 62, "Hugo Parisiensis sancti victoris canonicus religione et literarum scientia clarus et in VII liberalium artium peritia nulli sui temporis secundus fuit."

Character of the *Didascalicon.*

Of Hugh's writings we shall be chiefly concerned with the *Didascalicon,* or *Eruditio didascalica,*[2] a brief work whose six books occupy some seventy columns in Migne's

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[1] CE "Hugh of St. Victor," where is also given a good bibliography of works on Hugh's theology, philosophy, psychology, and pedagogy.

[2] I have employed the text in Migne PL vol. 176, cols. 739-812. It should be noted, however, that B. Hauréau, *Les Œuvres de Hugues de Saint-Victor, Essai critique, nouvelle edition,* Paris, 1886, demonstrated that there should be only six books of the *Didascalicon* instead of seven as in this edition and that of 1648. This will not affect our investigation, as we shall make no use of the seventh book, but we shall have later to discuss whether a passage on magic belongs at the close of the sixth book or not. There appears to be a somewhat general impression that the edition of 1648 is the earliest edition of Hugh's works, but the British Museum has an undated incunabulum of the "Didascolon" numbered IB. 859, fol. 254.

Vincent of Beauvais in the thirteenth century speaks of the "Didascolon" as in five books (*Speculum doctrinale,* XVIII, 62) but is probably mistaken. The MSS seem uniformly to divide the work into a prologue and six books, as in the following at Oxford:

New College 144, 11th (*sic*) century, folio bene exaratus et servatus, fols. 105-43, "Incipit prologus in Didascalicon."

Jesus College 35, 12th century, fol. 26-

St. John's 98, 14th century, fol. 123-

Corpus Christi 223, 15th century, fol. 73-

I have not noted what MSS of the *Didascalicon* there are in the British Museum. The following MSS elsewhere may be worth listing as of early date:

Grenoble 246, 12th century, fols. 99-133.

BN 13334, 12th century, fol. 52-, de arte didascalica, is probably our treatise, although the catalogue names no author.

BN 15256, 13th century, fol. 128-.

Still other MSS will be mentioned in a subsequent note.

Patrologia. It is especially devoted, as its first chapter clearly states, to instructing the student what to read and how to read. On the whole, especially for its early twelfth century date, it is a clear, systematic, and sensible treatise, which shows that medieval men were wider readers than has often been supposed and that they had some sound ideas on how to study. In order to have a basis for systematic study, Hugh describes and classifies the various arts and sciences, mechanical and liberal, theoretical and practical. He is possibly influenced in his definitions and derivations by Isidore's *Etymologies,* although he seldom if ever acknowledges the debt, whereas he cites Boethius a number of times, but at least his classification and arrangement of material are quite different from Isidore's. In this description and classification, and indeed throughout the treatise, Hugh seems to display no little originality of thought and arrangement—once he tells us of his own methods of study [1]—although his facts and details are mostly familiar ones from ancient authors and although he of course embodies generally accepted notions such as the *trivium* and *quadrivium.*

Meaning of *physica.*

To the four subjects of the *quadrivium* he adds *physica* or *physiologia,*[2] which he says "considers and investigates the causes of things in their effects and their effects in their causes." He quotes from Vergil's *Georgics,* (II, 479-)

> "Whence earthquakes come, what force disturbs the deep,
> Virtues of herbs, the minds and wraths of brutes,
> All kinds of fruits, of reptiles, too, and gems."

Thus *Physica* is more inclusive than the modern science of Physics, while Hugh evidently does not employ it in the specific sense of the art of medicine, of which the word *physica* was sometimes used in the medieval period. Hugh goes on to say that *Physica* is sometimes still more broadly interpreted to designate natural philosophy in contrast to logical and ethical philosophy. His quotation from the *Georgics* also causes one to reflect on the prominent part played in natural science from before Vergil to after Hugh by the semi-human characteristics ascribed to animals and the occult virtues ascribed to herbs and gems.

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[1] *Didasc.* VI, 3.

[2] *Ibid.,* II, 17.

The study of history.

Hugh's attitude to history is interesting to note in passing. In his classification of the sciences he does not assign it a distinct place as he does to economics and politics, but he shows his inchoate sense of the importance of the history of science and of thought by attempting a list of the founders of the various arts and sciences.[1] In this connection he adopts the theory of the origin of the Etruscans at present in favor with scholars, that they came from Lydia. He regards the study of Biblical or sacred history as the first essential for a theologian, who should learn history from beginning to end before he proceeds to doctrine and allegory.[2] Four essential points to note in studying history in Hugh's opinion are the person, the event, the time, and the place.

The two mathematics: astrology, natural and superstitious.

In discussing the *quadrivium* Hugh explains the significance of the terms, *mathematica, astronomia,* and *astrologia. Mathematica,* in which the first letter "t" has the aspirate, denotes sound doctrine and the science of abstract quantity, and embraces within itself the four subjects of the *quadrivium.* In other words it denotes mathematics in our sense of the word. But *matesis,* spelled without the aspirate, signifies that superstitious vanity which places the fate of man under the constellations.[3] Hugh thus allows for the com-

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[1] *Didasc.* III, 2.

[2] *Ibid.,* VI, 3.

[3] A similar distinction will be found in the *Glosses on the Timaeus* of William of Conches (Cousin, *Ouvrages inédits d'Abélard,* 1836, p. 649), one of Hugh's contemporaries of whom we shall presently treat. A little later in the twelfth century John of Salisbury (*Polycraticus,* II, 18) makes the distinction between the two *mateses* or mathematics lie rather in the quantity of the penultimate vowel "e". In the thirteenth century Albertus Magnus (*Commentary on Matthew,* II, 1) also distinguished between the two varieties of mathematics according to the length of the "e" in *"mathesis";* but he did not regard the second variety as necessarily superstitious, but as divination from the stars which might be either good or bad, like Hugh's *astrologia.*

Roger Bacon mentioned both methods of distinction between the true and false mathematics; but statements in his different works are not in agreement as to which case it is in which the "e" is long or short. In the *Opus Maius* (Bridges, I, 239 and note) and mon use since the time of the Roman Empire of the word *mathematicus* for an astrologer, and the frequent use of *mathematica* in the sense of the Greek word *mantike* or divination. He correctly states the Greek derivation of astrology and astronomy and employs those words in just about their modern sense. Astrology considers the stars in order to determine the nativity, death, and certain other events. For Hugh, however, it is not wholly a superstition, but "partly natural science, partly a superstition," since he believes that the condition of the human body as well as of other bodies depends upon the constellations, and that sickness and health as well as storms or fair weather, fertility and sterility, can be predicted from the stars, but that it is superstitious to assert their control over contingent events and acts of free will,—the same distinction as that made by Abelard.

The superlunar and sublunar worlds.

In an earlier discussion of the universe above and beneath the moon [1] Hugh had further emphasized the superiority of the heavenly bodies and their power over earthly life and nature. He distinguished three kinds of beings: God the Creator (*solus naturae genitor et artifex*) who alone is without beginning or end and truly eternal, the bodies of the superlunar world which have a beginning but no end and are called perpetual and divine, and sublunar and terrestrial things which have both a beginning and an end. The mathematicians call the superlunar world nature, and the sublunar world the work of nature, because all life and growth in it comes "through invisible channels from the

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Opus Tertium (caps. 9 and 65) he states that the vowel is short in the true mathematics and long in the superstitious variety; but in other writings he took the opposite view and declared that "all the Latins" were wrong in thinking otherwise (see Bridges, I, 239 note; Steele (1920) viii).

In a twelfth century MS at Munich (CLM 19488, pp. 17-23) a treatise or perhaps an excerpt from some longer work, entitled *De differentiis vocabulorum*, opens with the words, "Scire facit mathesis et divinare mathesis." Roger Bacon says (Steele, 1920, p. 3), "Set glomerelli nescientes Grecum . . . ex magna sua ignorancia vulgaverunt hos versus falsos:

Scire facit matesis, set divinare mathesis;
Philosophi matesim, magici dixere mathesim."

[1] *Didascalicon*, I, 7.

superior bodies." They also call the upper world time, because of the movements of the heavenly bodies in it determining time, and the lower world temporal, because it is moved according to the superior motions. They further call the superlunar world Elysium on account of its perpetual light and peace, while they call the other *Infernum* because of its confusion and constant fluctuation. Hugh adds that he has touched upon these points in order to show man that, in so far as he shares in this world of change, he is like it, subject to necessity, while in so far as he is immortal he is related to the Godhead.

Discussion of magic.

Hugh's brief, but clear and pithy, account of magic occurs in the closing chapter of his sixth and last book,[1] and seems to be rather in the nature of an *addendum*. It is, indeed, missing from the *Didascalicon* in some of the earliest manuscripts [2] and is found separately in the same collection of manuscripts, so that possibly it is not by Hugh. At any rate, magic is treated by itself apart from his previous description and classification of the arts and sciences and listing of their founders. The definition of magic makes it clear why it is thus segregated: "Magic is not included in philosophy, but is a distinct subject, false in its professions, mistress of all iniquity and malice, deceiving concerning the truth and truly doing harm; it seduces souls from divine religion, promotes the worship of demons, engenders corruption of morals, and impels the minds of its followers to every crime and abomination." Hugh had prefaced this definition by much the usual meager history of the origin of magic to be found in Isidore and other writers, but his definition proper seems rather original in its form and in a way admirable in its attitude. The ancient classical feeling that magic was evil and the Christian prejudice against it as the work of demons still play a large part in his summary of the subject, but to these two points that magic is hostile to Christianity or irreligious, and that it is improper, immoral, and criminal, he adds the other two points that it is not a part of philosophy—in other words, it is unscientific, and that it is more or less untrue and unreal. Or these four points may be reduced to two: since law, religion, and learning unite in condemning magic, it is unsocial in every respect; and it is more or less untrue, unreal, and unscientific.

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[1] *Didasc.* VI, 15 (Migne PL 176, 810-12).

[2] BN nouv. acq. 1429, 12th century, fols. 1v-23, and CLM 2572, written between 1182 and 1199; both end with the thirteenth chapter of Book VI, or at col. 809 in Migne. St. John's 98, 14th century, fol. 145v, also ends at this point. Jesus College 35, 12th century, is mutilated at the close.

Other early MSS, however, include the passage on magic in the *Didascalicon*, and end the sixth book with the closing words of the account of magic, "Hydromancy first came from the Persians": see Vitry-le-François 19, 12th century, fols. 1-46; Mazarine 717, 13th century, #9, closing at fol. 97v.

The passage on magic is also cited as Hugh's by Robert Kilwardby, archbishop of Canterbury 1272-1279, in his work on the division of the sciences, cap. 67: MSS are Balliol 3; Merton 261.

In Cortona 35, 15th century, fol. 203, the *Didascalicon* in six books is first followed by a brief passage, *Divisio philosophie continentium*, which is perhaps simply the fourteenth chapter of the sixth book as printed in Migne, and then at fol. 224 by the passage concerning magic and its subdivisions.

The account of magic also occurs in MSS which do not contain the *Didascalicon*, for instance, Vatic. Palat. Lat. 841, 13th century, fol. 139r, "Magice artis quinque sunt species. . . ."

Five sub-divisions of magic.

Hugh's list of various forbidden and occult arts which are sub-divisions of magic is somewhat similar to that of Isidore, but he classifies and groups them logically under five main heads in a way which appears to be partly his own, and which was followed by other subsequent writers, such as Roger Bacon. His first three main heads all deal with arts of divination. *Mantike* divides as usual into necromancy, geomancy, hydromancy, aerimancy, and pyromancy. Under *mathematica* are listed *aruspicina,* or the observation of hours *(horae)* or of entrails *(hara);* augury, or observation of birds; and *horoscopia,* or the observation of nativities. The third main head, *sortilegia,* deals with divination by lots. The fourth main head, *maleficia,* with which magic has already been twice identified in the chapter, is now described by Hugh as "the performance of evil deeds by incantations to demons, or by ligatures or any other accursed kind of remedies with the co-operation and instruction of demons."[1] Fifth and last come *praestigia*, in which "by phantastic illusions concerning the transformation of objects the human senses are deceived by demoniacal art."[2]

De bestiis et aliis rebus.

Among the doubtful and spurious works ascribed to Hugh is a bestiary in four books,[3] in which various birds and beasts are described, and spiritual and moral applications are made from them. At least this is the character of the first part of the treatise; towards the close it becomes simply a glossary of all sorts of natural objects. *Physiologus* is often cited for the natural properties of birds and beasts, but as we have already dealt with the problem of the *Physiologus* in an earlier chapter, and as we shall sufficiently deal with the properties and natures ascribed to animals in the middle ages in describing the treatment of them by various encyclopedists like Thomas of Cantimpré, Bartholomew of England, and Albertus Magnus, we are at present mainly interested in some other features of the treatise before us. It is often illustrated with illuminations of birds and animals in the manuscripts and was originally intended to be so, as the prologue on the hawk and dove by its monkish author to a noble convert, Raynerus, makes evident. "Wishing to satisfy the petitions of your desire, I decided to paint the dove whose 'wings are covered with silver, and her feathers with yellow gold,' and to edify minds by painting, in order that what the simple mind can scarcely grasp by the eye of the intellect, it might at least discern with the carnal eye, and vision perceive what hearing could scarcely comprehend. However, I wished not only to depict the dove graphically but to describe it in words and to explain the painting by writing, so that he whom the simplicity of the picture did not please might at least be pleased by the morality of Scripture." Indeed, the work is often entitled *The Gilded*

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[1] "Malefici sunt qui per incantationes daemonicas sive ligaturas vel alia quaecunque exsecrabilia remediorum genera cooperatione daemonum atque instructu nefanda perficiunt."

[2] "Praestigia sunt quando per phantasticas illusiones circa rerum immutationem sensibus humanis arte daemoniaca illuditur."

[3] Migne, PL 177, 13-164, "Hugo Raynero suo salutem. Desiderii tui petitionibus, charissime, satisfacere cupiens . . ."

Dove in the manuscripts. The treatise is manifestly of a religious and popular rather than scientific character. One interesting passage states that a monk should not practice medicine because "a doctor sometimes sees things which are not decent to see," and "touches what it is improper for the religious to touch." Furthermore, a physician "speaks of uncertain matters by means of experiments, but experience is deceitful and so often errs. But this is not fitting for a monk that he should speak aught but the truth." [1] It is rather surprising to find free will attributed to the wild beasts, who are said to wander about at their will.[2] This passage, however, is simply copied from Isidore.[3]

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[1] I, 45. "De incertis per experimenta loquitur, sed experimentum est fallax, ideo saepe fallitur. Sed hoc religioso non expedit ut alia quam vera loquatur."

[2] II, prologus. "Ferae appellantur eo quod naturali utantur libertate et desiderio suo ferantur. Sunt enim liberae eorum voluntates et huc atque illuc vagantur et quo animus duxerit eo feruntur."

[3] *Etymologiarum,* XII, ii, 2.

APPENDIX I

SOME MANUSCRIPTS OF DE BESTIIS ET ALIIS REBUS OR THE GILDED DOVE

The *De bestiis et aliis rebus* or *Columba deargentata* appears with other opuscula of Hugh of St. Victor or Hugh of Folieto in

Vendôme 156, 12th century, fol. 1v—, "Libellus cuiusdam ad fratrem Rainerum corde benignum qui Columba deargentata inscribitur. Desiderii tui, karissime, petitionibus satisfacere. . . ."

Dijon anciens fonds 225, 12th century, fols. 92v-98, "Prologus Hugonis prioris in librum de tribus columbis. Desiderii tui, karissime, petitionibus satisfacere. . . ."

Cambridge University has several copies, most of which seem to differ from the printed edition and from one another.

CUL 1574, 15th century, Liber de bestiis et aliis rebus; the arrangement is said to be very different from that in Migne.

CUL 1823, 12th century, "Liber bestiarum"; similar in text to the foregoing, but with a different order of chapters, "and there are both large omissions and insertions." The numerous figures of animals in outline "are remarkable for their finish and vigor."

CUL 2040, late 13th century, fols. 50-93, "De natura animantium"; said to be "substantially the same as that of Hugo de S. Victore; the arrangement, however, is very irregular."

CU Sidney Sussex 100, 13th century, James's description (pp. 115-7) shows it to be our treatise; for its fine miniatures see James (1895) pp. 117-20.

A few other MSS (doubtless the list can be greatly augmented) are:

Vitry-le-François 23, 13th century, fols. 1-23, illuminated, "Incipit libellus cuiusdam ad Rainerum conversum cognomine Corde

Benignum. Incipit de tribus columbis. Si dormiatis inter medios cleros . . ."; it closes without Explicit, ". . . per bonam operationem conformem reddit." Then follows at fol. 23v, "Incipit tractatus Hugonis de Folieto prioris canonicorum Sancti Laurentii in pago Ambianensi de claustro anime. . . ."

Vitry-le-François 63, 13th century, fol. 1-, "De tribus columbis ad Raynerum conversum cognomento Corde Benignum seu de natura avium. . . ."; followed at fol. 7-, by portions of De claustro anime.

BN 12321, 13th century, fol. 215v (where it follows works by St. Bernard), De naturis avium ad Rainerum conversum cognomine Corde benignum.

Bourges 121, 13th century, fol. 128-, "Libellus cuiusdam (Hugonis de Folieto) ad fratrem Rainerum corde benignum qui Columba deargentata inscribitur."

CLM 15407, 14th century, fol. 46, Libellus qui "Columba deargentata" inscribitur, etc.

CLM 18368, anno 1385, fol. 121, Hugonis de S. Victore Columba deargentata; fol. 124, Eiusdem avicularius.

CHAPTER XXXVI

ADELARD OF BATH

Place in medieval learning—Some dates in his career—Mathematical treatises—Adelard and alchemy—Importance of the *Natural Questions* —Occasion of writing—Arabic versus Gallic learning—"Modern discoveries"—Medieval work wrongly credited to Greek and Arab—Illustrated from the history of alchemy—Science and religion—Reason versus authority—Need of the telescope and microscope already felt—Some quaint speculative science—Warfare, science, and religion—Specimens of medieval scientific curiosity—Theory of sound—Theory of vision—Deductive reasoning from hot and cold, moist and dry—Refinement of the four elements hypothesis—Animal intelligence doubted—The earth's shape and center of gravity—Indestructibility of matter—Also stated by Hugh of St. Victor—Roger Bacon's continuity of universal nature—Previously stated by Adelard—Experiment and magic—Adelard and Hero of Alexandria—Attitude to the stars: *De eodem et diverso*—Attitude to the stars: *Questiones naturales*—Astrology in an anonymous work, perhaps by Athelardus—Authorities concerning spirits—Adelard's future influence—Appendix I. The problem of dating the *De eodem et diverso* and *Questiones naturales* and of their relations to each other—Difficulty of the problem—Before what queen did Adelard play the *cithara?*—Circumstances under which the *De eodem et diverso* was written—Different situation depicted in the *Natural Questions*—Some apparent indications that the *De eodem et diverso* was written after the *Natural Questions*—How long had Henry I been reigning?

"Quare, si quid amplius a me audire desideras, rationem refer et recipe."

— *Questiones naturales, cap. 6.*

Place in medieval learning.

WHILE the Breton, Abelard, and the Saxon, Hugh of St. Victor, were reviewing patristic literature from somewhat new angles and were laying the foundations of scholastic method, an Englishman, Adelard of Bath,[1] was primarily

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[1] For the *De eodem et diverso* I have used the text printed for the first time by H. Willner, *Des Adelard von Bath Traktat De eodem et diverso, zum ersten Male herausgegeben und historisch-kritisch untersucht,* Münster, 1903, in *Beiträge*, IV, i.

For the *Questiones naturales* I have used the *editio princeps* of interested in exploring the fields of mathematical and natural science. As Hugh came from Saxony to Paris and Abelard went forth from his native Brittany through the towns of France in quest of Christian teachers, so Adelard, leaving not only his home in England but the schools of Gaul where he had been teaching, made a much more extensive intellectual pilgrimage even to lands Mohammedan. "It is worth while," he declares in one of his works, "to visit learned men of different nations, and to remember whatever you find is most excellent in each case. For what the schools of Gaul do not know, those beyond the Alps reveal; what you do not learn among the Latins, well-informed Greece will teach you.[1] Adelard seems to have devoted himself especially to Arabian learning and to have made a number of translations from the Arabic, continuing at the beginning of the twelfth century that transfer of Graeco-Arabic science which we have associated with the name of Gerbert in the tenth century and which Constantinus Africanus carried on in the eleventh century. Adelard himself hints that some of his new ideas are not derived from his Arabian masters but are his own, and Haskins has well characterized him as a pioneer in the study of natural science.

Some dates in his career.

Adelard has been described as "a dim and shadowy figure in the history of European learning," [2] and the dates

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Louvain, 1480 (?), and what is supposed to be the original MS at Eton College, 161, (Bl. 6. 16). I have also examined BN 2389, 12th century, fols. 65r-81v, *Questiones naturales* from cap. 12 on; fols. 81v-90v, *De eodem et diverso* (sole extant text); and BN 6415, 14th century, where Adelard's *Natural Questions* are found together with William of Conches' *Dragmaticon philosophiae* and Bernard Silvester's *Megacosmus et microcosmus,* of which we treat in succeeding chapters. Professor H. Gollancz has recently translated the Latin text into English for the first time in his *Dodi Ve-Nechdi,* the work of Berachya based upon Adelard's and preserved in MSS at Oxford and Munich.

For Adelard's translation of the *Liber Ezich*, or astronomical tables of Al-Khowarizmi (as revised by Maslama at Cordova), I have used H. Suter, *Die astronomischen Tafeln des Muhammed ibn Musa Al-Khwarizmi,* Copenhagen, 1914.

For further bibliography of Adelard's writings see the articles on *Adelard of Bath,* by Professor C. H. Haskins in EHR 26 (1911) pp. 491-8, and 28 (1913) 515-6. These articles will henceforth be cited as *Haskins* (*1911*) and *Haskins* (*1913*).

[1] *De eodem et diverso,* p. 32.

[2] Haskins (1911) p. 491, who has, however, himself done much

of his birth and death are unknown. We possess, however, a number of his works and some may be either approximately or exactly dated. In the preface to his translation of the astronomical tables of Al-Khowarizmi he seems to give the year as 1126.[1] The Pipe Roll for 1130 informs us that Adelard received four shillings and six pence at that time from the sheriff of Wiltshire. This suggests that he was in the employ of the king's court,[2] and his brief treatise on the astrolabe seems to be dedicated to Prince Henry Plantagenet,[3] later Henry II, and to have been written between 1142 and 1146. It was probably one of his last works and in it he mentions specifically three earlier works.[4] Two other writings, which are the best known and apparently the most original of his works, namely the *Questiones Naturales* and *De eodem et diverso,* may be dated approximately from the fact that they are dedicated respectively to Richard, Bishop of Bayeux from 1107 to 1133, and to William, Bishop of Syracuse, who died in 1115 or 1116. Both works are addressed to Adelard's nephew, who is presumably the same person in both cases, one in the form of a letter, the other of a conversation, and both justify Adelard's studies in foreign lands. In an appendix to this chapter the question when these two treatises were written and their relations to each other will be discussed more fully.

Mathematical treatises.

The subjects of a majority of Adelard's known works and translations are mathematical or astronomical. The most elementary is a treatise on the abacus, *Regule abaci,*[5] in which his chief authorities are Boethius and Gerbert and he seems as yet unacquainted with Arabic mathematics.[6]

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to clear up this obscurity. I largely follow his account in the ensuing biographical and bibliographical details.

[1] But the passage giving this date has been found in but one MS; Suter (1914), pp. 5, 37.

[2] R. L. Poole, *The Exchequer in the Twelfth Century,* London, 1912, p. 56.

[3] CU McLean 165, "Heynrice cum sis regis nepos"; Haskins (1913) pp. 515-6.

[4] Namely, the translation of Euclid, *De eodem et diverso,* and *Liber Ezich.*

[5] Ed. Boncompagni, *Bullettino di Bibliografia e di Storia della Scienze matematiche,* XIV, 1-134.

[6] Unless indirectly through Gerbert.

But most of the mathematical treatises extant under Adelard's name are from the Arabic, such as his translation of Euclid's *Elements;* [1] of the astronomical tables of Al-Khowarizmi—who flourished under the patronage of the caliph Al-Mamum (813-833)—"apparently as revised by Maslama at Cordova," under the title *Liber Ezich;* and, if by a "Master A" Adelard is meant, of a treatise of the first half of the twelfth century on the four arts of the quadrivium and especially on astronomy, which is apparently also a work of Al-Khowarizmi.[2] Some of the introductory books on the quadrivium have been printed,[3] but "the astronomical treatise has not yet been specially studied." [4] One therefore cannot say how far it may indulge in astrology, but we are told that Adelard translated from the Arabic another "astrological treatise, evidently of Abu Ma'ashar Dja'afar," [5] or Albumasar. We have already mentioned in another chapter the ascription to Adelard of one Latin translation of the superstitious work of Thebit ben Corat on astrological images, and in the present chapter the treatise on the astrolabe for Henry Plantagenet.

Adelard and alchemy.

Adelard was interested in alchemy as well as astrology and magic, if the attribution to him in a thirteenth century manuscript [6] of the twelfth century version of the *Mappe clavicula* is correct. We have seen that the original version of that work was much older than Adelard's time, but he perhaps made additions to it, or translated a fuller Arabic version. The occurrence of some Arabic and English words in certain chapters of the later copies are perhaps signs of his contributions. Berthelot, however, thought that few of the new items in the twelfth century version originated with Adelard and that many of the additions were taken by him, or by whoever was responsible for the later version, from Greek rather than Arabic sources.[1]

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[1] The numerous MSS vary so in text and arrangement that it is not clear whether Adelard's work in its original form "was an abridgement, a close translation, or a commentary," (Haskins (1911) 494-5).

Professor David Eugene Smith states in his forthcoming edition of Roger Bacon's *Communia Mathematicae,* which he has very kindly permitted me to see in manuscript, that Roger refers several times to Adelard's *Editio specialis super Elementa Euclidis* —"a work now entirely unknown."

[2] *Liber ysagogarum Alchorismi in artem astronomicam a magistro A. compositus:* Haskins (1911) p. 493 for MSS.

[3] Ed. Curtze, in *Abhandl. z. Gesch, d. Math.,* VIII, 1-27.

[4] Haskins (1911) p. 494.

[5] *Ibid.,* 495, *Ysagoga minor Iapharis mathematici in astronomiam per Adelardum bathoniensem ex arabico sumpta.* It is perhaps worth noting the similarity of the *Incipit,* "Quicumque philosophie scienciam altiorem studio constanti inquirens. . . ." (Digby 68, 14th century, fols. 116-24), to the three *"Quicumque" Incipits* mentioned in our chapter on Gerbert (see above, Chapter 30, vol. I, page 707.)

[6] Royal 15-C-IV.

Importance of the *Natural Questions.*

Our attention will be devoted chiefly to the two treatises by Adelard which we have already mentioned as the most original of his works. Of these the *Natural Questions* are evidently much more important than the *De eodem et diverso,* which is largely taken up with a justification, in the style of allegorical personification made so popular by Martianus Capella and Boethius, and with much use of Plato's *Timaeus,* of the seven liberal arts against the five worldly interests of wealth, power, ambition, dignities, and pleasure. The *Natural Questions,* although put into a dramatic dialogue form somewhat reminiscent of Plato, deal without much persiflage with a number of concrete problems of natural science to which definite answers are attempted.

Occasion of writing.

Adelard opens the *Natural Questions* with brief allusion to the pleasant reunion with the friends who greeted him upon his return to England in the reign of Henry I after long absence from his native land for the sake of study. After the usual inquiries had been made concerning one another's health and that of their friends, Adelard asked about "the morals of our nation," only to learn that "princes were violent, prelates wine-bibbers, judges mercenary, patrons inconstant, the common men flatterers, promise-makers false, friends envious, and everyone in general ambitious." Adelard declared that he had no intention of conforming to this wretched state of affairs, and when asked what he did intend to do, since he would not practice and could not prevent such "moral depravity," replied that he intended to ignore it, "for oblivion is the only remedy for insurmountable ills." Accordingly that subject was dropped, and presently his nephew suggested and the others joined in urging that he disclose to them "something new from my Arabian studies." [1] From the sordid practical world back to the pure light and ideals of science and philosophy! Such has been the frequent refrain of our authors from Vitruvius and Galen, from Firmicus and Boethius on. It is further enlarged upon by Adelard in the *De eodem et diverso;* it has not quite lost its force even today; and parallels to Adelard's twelfth century lament on England's going to the dogs may be found in after-the-war letters to *The London Times* of 1919.

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[1] Berthelot (1906) 172-77, "Adelard de Bath et le *Mappe Clavicula,*" as well as the citations from other writings of Berthelot by Haskins (1911) 495-6.

Arabic versus Gallic learning.

The result of the request preferred by Adelard's friends is the present treatise in the form of a dialogue with his nephew, who proposes by a succession of questions to force his uncle to justify his preference for "the opinions of the Saracens" over those of the Christian "schools of Gaul" where the nephew has pursued his studies. The nephew is described as "interested rather than expert in natural science" [2] in the *Natural Questions,* while a passage in the *De eodem et diverso* implies that his training in Gaul had been largely of the usual rhetorical and dialectical character, since Adelard says to him, "Do you keep watch whether I speak aright, observing that modest silence which is your custom amidst the wordy war of sophisms and the affected locutions of rhetoric." [3] In the *Natural Questions* the nephew, as befits his now maturer years, has more to say, raising some objections and stating some theories as well as propounding his questions, but Adelard's answers constitute the bulk of the book. Beginning with earth and plants, the questions range in an ascending scale through the lower animals to human physiology and psychology and then to the grander cosmic phenomena of sea, air, and sky.

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[1] "Aliquid arabicorum studiorum novum me proponere exhortatus."

[2] "Nepos quidam meus in rerum causis magis implicans quam explicans."

[3] *De eodem et diverso,* p. 2, "Tu utrum recte texam animadverte, et ea qua soles vel in sophismatum verboso agmine vel in rhetoricae affectuosa elocutione modesta taciturnitate utere."

"Modern discoveries."

In agreeing to follow this method of question and answer Adelard explains at the start that on account of the prejudice of the present generation against any *modern* [1] discoveries he will attribute even his own ideas to someone else, and that, if what he says proves displeasing to less advanced students because unfamiliar, the blame for this should be attached to the Arabs and not to himself. "For I am aware what misfortunes pursue the professors of truth among the common crowd. Therefore it is the cause of the Arabs that I plead, not my own." [2] This is a very interesting passage in more ways than one. Adelard appears as an exponent of the new scientific school, stimulated by contact with Arabian culture. He is confident that he has valuable new truth, but is less confident as to the reception which it will receive. The hostility, however, in the Latin learned world is not, as one might expect, to Mohammedan learning. The process of taking over Arabic learning has apparently already begun—as indeed we have seen from our previous chapters—

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[1] Adelard uses the word *modernus* a number of times, and usually of his own age, although in one passage of the *De eodem et diverso* (p. 7, line 3) he speaks of the Latin writers, Cicero and Boethius, as *modernos* in distinction from Greek philosophers of whom he has previously been speaking. Other uses of the word in *De eodem et diverso* to apply to his own age are: p. 3, line 3; p. 19, line 24; p. 22, line 33.

Cassiodorus is said to be the first extant author to use *modernus*.

[2] *Quest. nat., Proemium.* "Habet enim haec generatio ingenitum vitium ut nihil quod a modernis reperiatur putent esse recipiendum, unde fit ut si quando inventum proprium publicare voluerim, personae id alienae imponens inquam, 'Quidam dixit, non ego,' Itaque—ne omnino non audiar—omnes meas sententias dans, 'Quidam invenit, non ego.' Sed haec hactenus.

. . . hoc tamen vitato incommodo ne quis me ignota proferentem ex mea id sententia facere, verum arabicorum studiorum sensa putet proponere. Nolo enim si quae dixero minus provectis displiciant, ego etiam eis displicere. Novi enim quis casus veri professores apud vulgus sequatur. Quare causam arabicorum non meam agam."

In the catalogue of books at Christ Church, Canterbury, which was drawn up while Henry of Eastry was prior (1284-1331), our treatise is listed as "Athelardus de naturalibus questionibus secundum Arabicos": James (1903) p. 126.

and Adelard's Christian friends are ready enough to hear what he has learned in Mohammedan lands and schools, although of course they may not accept it after they have heard it. But he fears that he "would not get a hearing at all," if he should put forward new views as his own. Indeed, he himself shows a similar prejudice against other novelties than his own in a passage in the *De eodem,* where he speaks impatiently and contemptuously of "those who harass our ears with daily novelties" and of "the new Platos and Aristotles to whom each day gives birth, who with unblushing front proclaim alike things which they know and of which they know nothing, and whose supreme trust is in extreme verbosity."[1] Adelard of course regarded his own new ideas as of more solid worth than these, but the fact remains that he was not after all the only one who was interested in promulgating novelties. Yet his justification for writing the *De eodem* is the silence of "the science of the moderns" compared with the fluency of the ancients, of whose famous writings he has read "not all, but the greater part."[2] It is not necessary, of course, to regard this passage and the preceding as inconsistent, but it is well to read the one in the light of the other.

Medieval work wrongly credited to Greek and Arab.

But let us return to the passage from the *Natural Questions* and Adelard's insinuation—slightly satirical no doubt, but also in part serious—that he has fathered new scientific notions of his own upon the Arabs. There is reason to think that he was not the only one to do this. Not only were superstitious and comparatively worthless treatises which were composed in the medieval period attributed to Aristotle and other famous authors, but this was also the case with works of real value. Also the number is suspiciously large of works of which the lost originals were supposedly by Greek or Arabian authors but which are extant only in later Latin "translations."

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[1] P. 7, "Cui tandem eorum credendum est qui cotidianis novitatibus aures vexant? Et assidue quidem etiam nunc cotidie Platones, Aristoteles novi nobis nascuntur, qui aeque ea quae nesciant ut et ea quae sciant sine frontis jectura promittunt; estque in summa verbositate summa eorum fiducia."

[2] *De eodem,* p. 1, "Dum priscorum virorum scripta famosa non omnia sed pleraque perlegerim eorumque facultatem cum modernorum scientia compararim, et illos facundos judico et hos taciturnos appello."

Illustrated from the history of alchemy.

This point may be specifically illustrated for the moment from the researches of Berthelot among alchemistic manuscripts, which have demonstrated that Latin alchemy of the thirteenth century was less superstitious and more scientific than in previous periods, whether among the ancient Greeks or more recent Arabs. He found but one treatise in Arabic which contained precise and minute details about chemical substances and operations. As a rule the Arabian alchemists wrote "theoretical works full of allegories and declamation." For a long time several works, important in the history of chemistry as well as of alchemy, were regarded as Latin translations of the Arab, Geber. But Berthelot discovered the Arabic manuscripts of the real Geber, which turned out to be of little value and largely copied from Greek authors. On the other hand, the Latin works which had gone under Geber's name were produced in the thirteenth and fourteenth centuries by men who seem, like Adelard of Bath, to have preferred to ascribe their own ideas to the Arabs. Let us examine for a moment with Berthelot [1] the chief of these Latin treatises. It is a "a systematic work, very well arranged. Its modest method of exposition" differs greatly from "the vague and excessive promises of the real Geber." Much of the book possesses "a truly scientific character" and "shows the state of chemical knowledge with a precision of thought and expression unknown to previous authors." As for Adelard's new ideas, we may not regard them as so novel as they seemed to him, nor estimate them so highly in comparison with ancient Greek science as Berthelot did medieval compared with Greek alchemy—much of Adelard's thought may be derived by him from those ancient writings in which he claims to have read so widely—but they were probably as new to Adelard's Latin contemporaries as they were to himself.

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[1] Berthelot (1893) I, 344-7.

Science and religion.

While Adelard's English friends displayed no bigoted opposition to the reception of Saracen science, the question of science and religion is raised in another connection in the very first of the questions concerning nature which the nephew puts to his uncle. The nephew inquires the reason for the growth of herbs from earth, asking, "To what else can you attribute this save to the marvelous effect of the marvelous divine will?" Adelard retorts that no doubt it is the Creator's will, but that the operation is also not without a natural reason. This attitude of independent scientific investigation is characteristic of Adelard. Again in the fourth chapter when the nephew displays a tendency to ascribe all effects to God indifferently as cause, Adelard objects. He insists that he is detracting in no way from God, whom he grants to be the source of all things, but he holds that nature "is not confused and without system" and that "human science should be given a hearing upon those points which it has covered." On the other hand he has no desire in the present treatise to overstep the bounds of natural science and enter the field of theology. When his nephew towards the close wishes him to go on and discuss the problem of God's existence and nature, he wisely responds, "You are now broaching a question to me where it is easier to disprove what isn't so than to demonstrate what is," [1] and that they had better go to bed and leave this big question for another day and another treatise.[2]

Reason versus authority.

Besides preferring the learning of Arabian and other distant lands to the schools of Gaul, and favoring scientific investigation rather than unquestioning faith, Adelard also sets reason above authority. He not only complains of his generation's inborn prejudice against new ideas, but later on, when his nephew proposes to turn his questions from the subject of plants to that of animals, enters upon a longer diatribe against scholastic reliance upon past authorities. "It is difficult for me to discuss animals with you. For I learned from my Arabian masters under the leading of reason; you, however, captivated by the appearance of authority, follow your halter. Since what else should authority be called than a halter? For just as brutes are led where one wills by a halter, so the authority of past writers leads not a few of you into danger, held and bound as you are by bestial credulity. Consequently some, usurping to themselves the name of authority, have used excessive license in writing, so that they have not hesitated to teach bestial men falsehood in place of truth. For why shouldn't you fill rolls of parchment and write on both sides, when in this age you generally have auditors who demand no rational judgment but trust simply in the mention of an old title?"[1] Adelard adds that those who are now reckoned authorities gained credence in the first instance by following reason, asserts that authority alone is not enough to convince, and concludes with the ultimatum to his nephew: "Wherefore, if you want to hear anything more from me, give and take reason. For I'm not the sort of man that can be fed on a picture of a beefsteak."[2]

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[1] Cap. 77. I cite chapters as numbered in the *editio princeps*.

[2] To which the nephew cheerfully assents.

Need of the telescope and microscope already felt.

The history of natural philosophy and science has demonstrated that the unaided human reason has not been equal to the solution of the problems of the natural universe, and that elaborate and extensive observation, experience, and measurement of the natural phenomena are essential. But exact scientific measurement was not possible with the unaided human senses and required the invention of scientific instruments. As Adelard says in *De eodem et diverso*, "The senses are reliable neither in respect to the greatest nor the smallest objects. Who has ever comprehended the space of the sky with the sense of sight? . . . Who has ever distinguished minute atoms with the eye?"[3] Notable natural questions these, showing that the need of the telescope and microscope was already felt and that the discovery must in due time follow!

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[1] *Quest. nat.*, cap. 6.

[2] *Quest. nat.*, cap. 6, "Quare, si quid amplius a me audire desideras, rationem refer et recipe. Non enim ego ille sum quem pellis pictura pascere possit."

[3] *De eodem et diverso*, p. 13.

Some quaint speculative science.

We must not, therefore, unduly blame Adelard for placing, like the Greek philosophers before him, somewhat excessive trust in human reason and believing that "nothing is surer than reason, nothing falser than the senses."[1] But in consequence much of his discussion is still in the speculative stage, and uncle as well as nephew shows the influence of dialectical training. Some quaint and amusing instances may be given. Asked why men do not have horns like some other animals, Adelard at first objects to the question as trivial; but when his nephew urges the utility of horns as weapons of defence, he replies that man has reason instead of horns, and that, as a social as well as bellicose animal, man requires weapons which he can lay aside in times of peace.[2] Asked why the nose, with its impurities, is placed above the mouth, through which we eat, Adelard answers that nothing in nature is impure, and that the nose serves the head and so should be above the mouth which serves the stomach.[3] Such arguing from the fitness of things and from design was common in the Greek philosophers whom Adelard had read, and in judging his treatise we must compare it with such books as the *Saturnalia* of Macrobius which he cites,[4] the *Natural Questions* of Seneca, Plato's *Timaeus,* and the *Problems* of Aristotle,[5] rather than with works of modern science.

Warfare, science, and religion.

It is noteworthy, however, even in these two amusing instances that the argument from design is questioned, while the question about horns Adelard perhaps inserted as a sly hit against the militarism of the feudal age. Little recked he of the horrible substitutes for horns that twentieth century warfare would work out with the aid of modern science. The medieval church has too often been wildly accused of persecuting natural scientists and it has been erroneously stated that Roger Bacon dared not reveal the secret of the mariner's compass—which really was well known before his time—for fear of being accused of magic.[1] There is somewhat more plausibility in the theory that he concealed the invention of gunpowder from fear of the inquisition,[2] since there appears to have been a certain medieval prejudice against inhuman war inventions, which historians of artillery somewhat impatiently ascribe to "ignorance, religion, and chivalry," and which they hold prevented the use of Greek fire in the west.[3] At any rate in Adelard's day the Second Lateran Council attempted to prohibit the use of military engines against men on the ground that they were too murderous.[4]

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[1] *De eodem et diverso,* p. 13.

[2] *Quest. nat.,* cap. 15.

[3] *Ibid.,* cap. 19.

[4] *Ibid.,* cap. 35.

[5] The ascription of this work to Aristotle is questioned by D'Arcy W. Thompson (1913), 14, note, who calls attention to the fact that the majority of the numerous place-names in it are from southern Italy or Sicily; "and I live in hopes of seeing this work, or a very large portion of it, expunged, for this and other weightier reasons, from the canonical writings of Aristotle."

Specimens of medieval scientific curiosity.

Returning to the *Natural Questions,* we may note that, like the *Problems* of Aristotle, they vary from such crude queries as might occur to any curious person without scientific training to others that imply some previous theory or knowledge. A list of some of them will illustrate the scope of the scientific curiosity of the time. When one tree is grafted upon another, why is all the fruit of the nature of the grafted portion? Why do some brutes ruminate; why are some animals without stomachs; and why do some which drink make no water? Why do men grow bald in front? Why do some animals see better in the night than in the day and why can a man standing in the dark see objects that are in the light, while a man standing in the light cannot see objects that are in the dark? Why are the fingers of the human hand of unequal length and the palm hollow? Why don't babies walk as soon as they are born, and why are they at first nourished upon milk, and why doesn't milk agree equally with old and young? Why do we fear dead bodies?[1] A number of questions are devoted to each of the topics, vision, hearing, and heat, while the senses of taste, smell, and touch are dismissed in a single question and answer.[2]

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[1] See below, chapter 61, page 621.

[2] I refute this theory, however, in Appendix II to the chapter on Bacon.

[3] Reinaud et Favé, *Le feu grégeois et les origines de la poudre à canon,* (1845) p. 210. In the quotation from Christine de Pisan at pp. 219-20, however, it seems to me that she has reference only to the poisons last-named and not to the Greek fires previously named in declaring them inhuman and against all the laws of war.

[4] *Ibid.,* p. 128.

Theory of sound.

The discussion of sound and vision may be noted more fully. The nephew has already learned from his Boethius something similar to the wave theory of sound. He states that when the air has been formed by the mouth of the speaker and impelled by the tongue, it impresses the same form upon that which is next to it, and that this process is repeated over and over just as concentric circles are formed when a stone is thrown into water.[3] Vitruvius had given the same explanation in discussing the acoustics of a theater.[4] But when the nephew asks his uncle how the voice can penetrate an iron wall, Adelard replies that every metal body, no matter how solid, has some pores through which the air can pass.[5] Thus he appears to regard air as the only substance which can transmit or conduct sound waves. His notion that air can pass through solids reminds one a little of the milder theory of Hero of Alexandria that heat and light consist of material particles which penetrate the interstices between the atoms composing air and water.[6] But it hardly seems as if Adelard could have derived *his* notion from Hero, since the impermeability of metal vessels to air is a fundamental hypothesis in many of the devices of Hero's *Pneumatics*.

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[1] The questions thus far listed occur in the order of mention in the following chapters: 6, 7, 10, 11, 20, 12, 30, 36, 37, 38, 39, 40, 46.

[2] *Quest. nat.*, cap. 31.

[3] *Quest. nat.*, cap. 21.

[4] *De architectura*, V, iii, 6 (Morgan's translation). "Voice is a flowing breath of air, perceptible to the hearing by contact. It moves in an endless number of circular rounds, like the innumerably increasing circular waves which appear when a stone is thrown into smooth water, and which keep on spreading indefinitely from the center unless interrupted by narrow limits, or by some obstruction which prevents such waves from reaching their end in due formation. When they are interrupted by obstructions, the first waves, flowing back, break up the formation of those which follow.

[5] *Quest. nat.*, cap. 22.

[6] See above, chapter 5, vol. I, page 191.

Theory of vision.

Adelard's theory of vision, that of extramission of "a visible spirit," is similar to that of Plato in the *Timaeus*, by which he was not unlikely influenced. The visible spirit passes from the brain to the eye through "concave nerves which the Greeks call optic," and from the eye to the object seen and back again "with marvelous celerity." [1] It would be interesting to know certainly whether Adelard penned this passage before John of Spain translated into Latin the *De differentia spiritus et animae*, in which Costa ben Luca speaks of "hollow nerves" from the brain to the eye through which the *spiritus* passes for the purpose of vision.[2] Apparently Adelard was first, since the *Natural Questions* were finished at some time between 1107 and 1133, while John of Spain is said to have made his translation for Raymond who was archbishop of Toledo from 1130 to 1150. Were the manuscripts not so insistent in naming John as translator,[3] we might think that Adelard had translated the *De differentia spiritus et animae*. Very possibly he had come across it during his study with Arabian masters. But he shows no acquaintance with the optical researches of Al-Hazen or with the treatise on *Optics* ascribed to Ptolemy, which last is extant only in the twelfth century Latin translation by Eugene of Palermo, admiral of Sicily.[4] However, the fact that three other theories of vision than the one which Adelard accepts are set forth by his nephew suggests that the problem was attracting attention. Pliny's *Natural History* gave no theory of vision whatever, although he listed various cases of extraordinary sight. Boethius, on the other hand, briefly adverted to the opposing theories of vision by extramission and intramission in the first chapter of his work on music. As for the marvelous celerity of the visible spirit, Augustine had enlarged upon the vast distance to the sun and back traveled by the visual ray in an instant or twinkling of an eye.[5]

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[1] *Quest. nat.*, cap. 23.

[2] See above, chapter 28, I, 659.

[3] See above, chapter 28, I, 657.

[4] See above, chapter 3, page 107.

[5] *De Genesi ad litteram*, IV, 34; Migne, PL 34, 319-20.

Deductive reasoning from hot and cold, moist and dry.

Throughout the *Natural Questions* Adelard's explanations and answers are based in large measure upon the familiar hypothesis of the four elements and of the four qualities, hot and cold, dry and moist. When asked, for instance, why all ruminating animals begin to lie down with their hind legs, he explains that their scanty animal heat is the cause of their ruminating to aid digestion, and that there is more frigidity in their posterior members, which are consequently heavier and so are bent first in reclining. The nephew thinks that here he has caught his uncle napping, and asks why is it then that in rising they lift themselves first onto their hind legs. But Adelard is not to be so easily nonplussed, and explains that after they have lain down and rested, they feel so refreshed that they lift their heavier limbs first.[1] Again, asked why persons of quick perception often have faulty memories, Adelard suggests that a moist brain is more conducive to intelligence, but a dry one to memory. Thus moist potter's clay receives impressions more readily but also easily loses them; what is drier receives the impression with more difficulty but retains it.[2] In a third passage, Adelard explains his nephew's weeping in his joy at seeing his uncle safely returned by the theory that his excessive delight overheated his brain and distilled moisture thence.[3]

Refinement of the four elements hypothesis.

Adelard, however, like Galen, Constantinus Africanus, Basil, and other writers before him, finds it advisable to refine the theory of the four elements. He is at pains in his answer to the nephew's very first question to explain that what we commonly call earth is not the element earth, and that no one ever touched the pure element water, or saw the elements air and fire. Every particular object contains all four elements and we deal in daily life only with compounds. In an herb, for instance, unless there were fire, there would be no growth upward; unless there were water or air, no spreading out; and without earth, no consistency. Moreover, when Adelard is asked why some herbs are spoken of as hot by nature, although all plants have more earth than fire in their composition, he says that while earth predominates quantitatively, efficaciously they are more fiery, just as his green cloak is larger than his green emerald, but much less potent.[1] Thus comes in the theory of occult virtue to help out the inadequate and unsatisfactory hypothesis of four elements and four qualities. We shall find our subsequent authors often resorting to the same explanation.

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[1] *Quest. nat.*, caps. 8-9.

[2] *Ibid.*, cap. 17.

[3] *Ibid.*, cap. 32. On "weeping as a salutation," see J. G. Frazer (1918) II, 82-93.

Animal intelligence doubted.

Adelard may believe in the marvelous virtue of emeralds, to which indeed he alludes rather inadvertently, but we do not find in the *Natural Questions* any of the common tales concerning remarkable animal sagacity or malice. This may be mere accident or it may be due to his warning in introducing the discussion of animals to give and take reason only. However, the question is discussed whether the brutes possess souls,[2] and he states that the common people are sure that they do not, and that only philosophers assert that animals have souls. This does not mean that their souls are rational, however: either animals possess "neither intelligence nor discretion but only opinion which is founded not in the soul but in the body"; or perhaps they have "some judgment why they seek and avoid certain things," and such discretion of sense as enables a dog to distinguish scents. If they possess such animal souls, do these perish with the body?

The earth's shape and center of gravity.

Adelard is correctly informed as to the shape of the earth and its center of gravity. Asked how the terrestrial globe is upheld in the midst of space, he retorts that in a round space it is evident that the center and the bottom are the same.[3] This thought is reinforced by the next question, If there were a hole clear through the earth and a stone were dropped in, how far would it fall? Adelard correctly answers, Only to the center of the earth. The same question is asked of Adelard by a Greek in the *De eodem et diverso,* so that, in case we regard the *De eodem* as written before the *Natural Questions,* it would appear that he had not derived his conclusion in this matter from either the Greeks or the Arabs. However, we have heard Plutarch scoff at the statement that bars weighing a thousand talents would stop falling at the earth's center, if a hole were opened up through the earth.[1]

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[1] *Quest. nat.*, cap. 2.

[2] *Ibid.*, caps. 13-14.

[3] *Ibid.*, cap. 48.

Indestructibility of matter.

In a recent review of Sir William Ramsay's *The Life and Letters of Joseph Black, M.D.,* it is stated, "The nature of the experiment he (Black) made is not now known, but his tremendous comment on it was, 'Nothing escapes!' Have we here really the first glimmering of the great principle of the indestructibility of matter which, with the associated principle regarding energy, forms the foundation of modern chemistry and physics?"[2] To this the answer is, "No." Adelard of Bath stated the indestructibility of matter eight centuries earlier, and apparently not as the result of any experiment. But his utterance was fuller and more explicit than that of Black. "And certainly in my judgment nothing in this world of sense ever perishes utterly, or is less today than when it was created. If any part is dissolved from one union, it does not perish but is joined to some other group."[3]

Also stated by Hugh of St. Victor.

The indestructibility of matter is also stated by Adelard's contemporary, Hugh of St. Victor, who remarks in the *Didascalicon* that of earthly things which have a beginning and an end "it has been said, 'Nothing in the universe ever dies because no essence perishes.' For the essences of things do not change, but the forms. And when a form is said to change, it should not be so understood that any existing thing is believed to perish utterly and lose its being, but only to undergo alteration, either perchance so that those things which were joined are separated, or those joined which had been separated. . . ."[1] Hugh was quite certainly a younger man than Adelard, but it is not so certain that the *Didascalicon* was written after the *Natural Questions,* although it is probable. Or Hugh may have heard Adelard lecture in Gaul or learned his view concerning the indestructibility of matter indirectly. Or they both may have drawn it independently from a common source.[2]

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[1] Chapter 6, I, 219.

[2] London Weekly Times, Literary Supplement, Nov. 15, 1918, p. 549.

[3] *Quest. nat.,* cap. 4, "Et meo certo iudicio in hoc sensibili mundo nihil omnino moritur nec minor est hodie quam cum creatus est. Si qua pars ab una coniunctione solvitur, non perit sed ad aliam societatem transit."

Roger Bacon's continuity of universal nature.

In an article entitled *Roger Bacon et l'Horreur du Vide*[3] Professor Pierre Duhem advanced the thesis that in place of the previous doctrine that nature abhors a vacuum Roger Bacon was the first to formulate a theory of universal continuity. This was an incorrect hypothesis, it is true, but one which Professor Duhem believed to have served the useful purpose of supplementing "the Peripatetic theory of heavy and light" until the discovery of atmospheric pressure. This theory developed in connection with certain problematical phenomena of which this "experiment" is the chief and typical case. If there be suspended in air a vessel of water having a hole in the top and several narrow apertures in the bottom, no water will fall from it as long as the superior aperture is closed. Yet water is heavier than air and according to the principles of Aristotle's *Physics* should fall to the ground. Writers before Roger Bacon, according to Duhem, explain this anomaly by saying that the fall of the water would produce a vacuum and that a vacuum cannot exist in nature. But Bacon argues that a vacuum cannot be the reason why the water does not fall, because a vacuum does not exist; he then explains further that although by their particular natures water tends downwards and air upwards, by their nature as parts of the universe they tend to remain in continuity. Duhem held that Roger Bacon was the first to substitute this positive law of universal continuity for the mere negation that a vacuum cannot exist in nature.[1]

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[1] *Didascalicon* I, 7 (Migne, PL 746).

[2] Plotinus had said, "Nothing that really is can ever perish" (οὐδὲν ἀπολεῖται τῶν ὄντων), as Dean Inge notes, *The Philosophy of Plotinus,* 1918, I, 189. There is also resemblance between the *Didascalicon* (II, 13) and *De eodem et diverso* (p. 27, line 7) in their division of music into mundane, human, and instrumental. For this Boethius is very likely the common source.

[3] In *Roger Bacon Commemoration Essays,* ed. by A. G. Little, Oxford, 1914, pp. 241-84.

Previously stated by Adelard.

Professor Duhem supported his case by citation of Greek, Byzantine, and Arabic sources and by use of writings of fourteenth century physicists available only in manuscripts. But unfortunately for his main contention he overlooked a remarkable passage written by Adelard of Bath over a century before Roger Bacon. In the fifty-eighth chapter of the *Natural Questions* the nephew says, "There is still one point about the natures of waters which is unclear to me." He then asks his uncle to explain a water jar, similar to that just described, which they had once seen at the house of an enchantress. Adelard replies in his clear, easy style, so different from the scholastic discussion in Bacon's corresponding passages. "If it was magic, the enchantment was worked by violence of nature rather than of waters. For although four elements compose the body of this world of sense, they are so united by natural affection that, as no one of them desires to exist without another, so no place is or can be void of them. Therefore immediately one of them leaves its position, another succeeds it without interval, nor can one leave its place unless some other which is especially attached to it can succeed it." Hence it is futile to give the water a chance to escape unless you give the air a chance to enter. Be it noted that Adelard not only thus anticipates the theory of universal continuity, but also in the last clause of the quotation approaches the doctrine of chemical affinity in the formation and disintegration of molecules. Finally, he describes what actually occurs in the experiment more accurately than Roger Bacon or the other physicists cited by Duhem. "Hence it comes about that, if in a vessel which is absolutely tight above an aperture is made below, the liquid flows out only interruptedly and with bubbling. For as much air gets in as liquid goes out, and this air, since it finds the water porous, by its own properties of tenuity and lightness makes its way to the top of the vessel and occupies what seems to be a vacuum."

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[1] *Roger Bacon Essays*, p. 266.

Experiment and magic.

This detailed and accurate description of exactly what takes place shows us Adelard's powers of observation and experiment at their best, and compares favorably with two cruder examples of experimentation which he ascribes to others. He states that it was discovered experimentally which portion of the brain is devoted to the imagination and which parts to reason and memory through a case in which a man was injured in the front part of the head.[1] In the other instance some philosophers, in order to study the veins and muscles of the human body, bound a corpse in running water until all the flesh had been removed by the current.[2] But the question remains, how often did Abelard exercise his powers of accurate observation by actual experiments? Certainly one thing is noteworthy, that the best and almost sole experiment that he details is represented by him as suggested by the magic water jar of an enchantress. Thus we are once again impelled to the conclusion that experimental method owes a considerable debt to magic, and that magic owed a great deal to experimental method.

Adelard and Hero of Alexandria.

We are also reminded of the association of similar water-jars with thaumaturgy in the *Pneumatics* of Hero of Alexandria.[3] It will be noted that Adelard is content with a single illustration of the principle involved, while Hero kept reintroducing instances of it. And while Hero gave little more than practical directions, Adelard gives a philosophical interpretation of and scientific deduction from the experiment. But he also describes what actually occurs more accurately, admitting that some liquid will gradually flow out even when the air-hole is kept closed. Here again, as in the case of the theory of the penetration of the particles of one substance between those of another mentioned in our paragraph above on the theory of sound, it is difficult to say whether Adelard was acquainted with Hero's works. Probably it is only chance that Hero's *Pneumatics* seems to contain almost exactly the same number of theorems as Adelard's *Natural Questions* has chapters.[1]

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[1] *Quest. nat.*, cap. 16. For a somewhat similar passage in Augustine see *De Genesi ad litteram*, VII, 18 (Migne, PL 34, 364).

[2] *Ibid.*, cap. 18.

[3] See above, chapter 5, I, 191.

Attitude to the stars: *De eodem et diverso.*

It remains to consider Adelard's attitude towards the stars, which is very similar to that of Plato's *Timaeus.* We have already seen that he translated works of Arabic astrology. Such a work as the tables of Al-Khowarizmi evidently has an astrological purpose, enabling one to find the horoscope accurately. In the *De eodem et diverso* he calls the celestial bodies "those superior and divine animals," and "the causes and principle of inferior natures." One who masters the science of astronomy can comprehend not only the present state of inferior things but also the past and the future.[2] The existence of music, says Adelard in another passage, supplies philosophers with a strong argument for their belief that "the soul has descended into the body from the stars above."[3] In the *De eodem et diverso* Adelard also expresses the belief that from present phenomena the mind can look ahead far into the future, and that the soul can sometimes foresee the future in dreams.[4]

Attitude to the stars: *Questiones Naturales.*

In the *Natural Questions*[5] Adelard again alludes to the stars as "those superior animals," and when asked whether they are animated replies that he deems anyone to be without sense who contends that the stars are senseless, and that to call those bodies lifeless which produce vitality in other bodies is ridiculous. He regards "the bodies of the stars" as composed of the same four elements as this world of inferior creation, but he believes that in their composition those elements predominate which conduce most to life and reason, and that the celestial bodies are more fiery than terrestrial bodies. "But their fire is not harsh, but gentle and harmless. It therefore follows that it is obedient to and in harmony with sense and reason." Their form, too, being "full and round," is especially adapted to reason. Finally, if reason and foresight exist even in our dark and perturbed lower world, how much more must the stars employ intelligence in their determined and constant courses? When the nephew proceeds to inquire what food the stars eat, since they are animals, Adelard shows no surprise, but answers that as diviner creatures they use a purer sustenance than we, namely, the humidities of earth and water which, extenuated and refined by their long upward transit, neither augment the stars in weight nor dull their reason and prudence. But when the nephew asks whether the *aplanon* or outermost and immovable sphere of heaven should be called God or not, Adelard answers that to assert this is in one sense philosophical but in another, insane and abominable, and he then avoids further discussion by terminating the treatise.

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[1] That is, 78 and 77.

[2] *De eodem et diverso,* p. 32.

[3] *Ibid.,* p. 10.

[4] *Ibid.,* p. 13.

[5] *Quest. nat.,* caps. 74-77.

Astrology in an anonymous work, perhaps by Athelardus.

For some reason, which I failed to discover, the catalogue of the Cotton manuscripts in the British Museum, in describing "a philosophical treatise concerning the principles of nature, the power of celestial influences on minds and morals, and other matters," [1] states that "the author seems to be Athelardus." The treatise is perhaps of later date than Adelard of Bath, but as it would be equally difficult to connect it with any other of our authors, we will give some account of it now. It seems to be incomplete as it stands both at the beginning and end, but the main interest in the portion preserved to us is astrological. Authorities are cited such as Hermes Trismegistus, Theodosius, Ptolemy, Apollonius of Thebes, "Albateni," and "Abumaxar." Discussing the number of elements our author states that medical men speak of the four parts of the inferior world, fire, air, water, earth,[1] but that astrologers make the number of the elements twelve, adding the eight parts of the superior world.[2] Later our author argues further for astrological influence as against "the narrow medical man who thinks of no effects of things except those of inferior nature merely." [3] Our author holds that forms come from above to matter here below, and discusses the influence of the sky on the generation of humans and metals, plants and animals, and connects seven colors and seven metals with the planets.[4] He furthermore, in all probability following Albumasar in this, asserts that the course of history may be foretold by means of astrology and that different religions go with different planets.[5] The Jews are under Saturn; the Arabs, under Venus and Mars, which explains the warlike and sensual character of their religion; the Christian Roman Empire, under the Sun and Jupiter. "Ancient writers argue" and "present experience proves" [6] that the Sun stands for honesty, liberality, and victory; Jupiter, for peace, equity, and humanity. The constant enmity between the Jews and Christians, and Moslems and Christians, is explained by the fact that neither Mars nor Saturn is ever in friendly relation with Jupiter. These three religions also observe the days of the week corresponding to their planets: the Christians, Sunday; the Moslems, Friday or Venus's day; the Jews, Saturday. Our author also explains the worships of the Egyptians and Greeks by their relation to signs of the zodiac.

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[1] Cotton Titus D, iv, fols. 75-138v, opening "fiat ordinata parato quo facile amplectamur . . .", and closing "pars tercia tocius orbis terreni. unde reliqua duo spacia reliqua."

Authorities on spirits.

Despite the allusion just mentioned to "the experience of to-day," our author perhaps shows too great a tendency to cite authorities to be that Adelard of Bath who wished to give and take reason and reproved his nephew for blind trust in authority. In discussing the theme of spirits and demons [7]—a different problem, it is true, from natural questions—he thinks that "it is enough in these matters to have faith in the authority of those who, divinely illuminated, could penetrate into things divine by the purer vision of the mind." He proceeds to cite Apuleius and Trismegistus, Hermes in *The Golden Bough,* "Apollonius" in *The Secrets of Nature,* which he wrote alone in the desert, and Aristotle who tells of a spirit of Venus who came to him in a dream and instructed him as to the sacrifice which he should perform under a certain constellation.

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[1] Cotton Titus D, iv, fol. 77r.

[2] *Ibid.*, fol. 78r.

[3] *Ibid.*, fol. 126v.

[4] *Ibid.*, fols. 127-32.

[5] *Ibid.*, fols. 113-4.

[6] fol. 113v, "Et antiqui scripture arguunt et hodierni temporis experimentum probat" . . .

[7] *Ibid.*, fols. 120v-124v.

Adelard's future influence.

But I would close this chapter on Adelard not with superstition from a treatise of dubious authenticity, but rather with reaffirmation of the importance in the long history of science of his brief work, the *Natural Questions.* Its probable effects upon Hugh of St. Victor and Roger Bacon are instances of its medieval influence to which we shall add in subsequent chapters. But most impressive is the fact that within such compact compass it considers so many problems and topics that are still of interest to modern science. For instance, its two concrete examples of the stone dropped into a hole extending through the earth's center and of the magic water jar have been common property ever since.

APPENDIX I

THE PROBLEM OF DATING THE DE EODEM ET DIVERSO AND QUESTIONES NATURALES AND OF THEIR RELATIONS TO EACH OTHER

Difficulty of the problem.

It is a difficult matter to fix the date either of the *De eodem et diverso* or of the *Questiones Naturales,* and to account satisfactorily for the various allusions to contemporary events and to Adelard's own movements which occur in either. It is not even entirely certain which treatise was written first, as neither contains an unmistakable allusion to the other. On general grounds the *De eodem et diverso* would certainly seem the earlier work, but there are some reasons for thinking the contrary. It seems clear that not many years elapsed between the composition of the two works, but how many is uncertain. It is evident that the *De eodem et diverso* must have been written by 1116 at the latest in order to dedicate it to William, bishop of Syracuse. But the *Questiones naturales* apparently might have been dedicated to Richard, bishop of Bayeux, at almost any time during his pontificate from 1107 to 1133, although probably not long after 1116.

Before what queen did Adelard play the *cithara?*

Professor Haskins would narrow down the time during which the *De eodem et diverso* could have been written to the years from about 1104 to 1109, with the single year 1116 as a further possibility. He says, "Adelard speaks of having played the *cithara* before the queen in the course of his musical studies in France the preceding year, and as there was no queen of France between the death of Philip I and the marriage of Louis VI in 1115, the treatise, unless the bishop of Syracuse was still alive in 1116, would not be later than 1109."[1] But may not the queen referred to have been Matilda, the wife of Henry I?[2] She was a patroness both of artists and of men of letters, and the Pipe Roll for 1130 and the treatise on the astrolabe have shown us that later, at least, it was the English royal family with which Adelard, himself an Englishman, was connected. It is of "Gaul," not of "France" in the sense of territory subject to the French monarch, that Adelard writes,[3] and Normandy was of course under Henry's rule after the battle of Tinchebrai in 1106.

Circumstances under which the *De eodem et diverso* was written.

The *De eodem et diverso* takes the form of a letter[4] from Adelard to his nephew, justifying his "laborious itinerary" in pursuit of learning against the reproach of "levity and inconstancy" made by the nephew, and stating "the cause of my travel among the learned men of various regions," at which the nephew has time and again expressed his astonishment, and the reasons for which his uncle has kept concealed from him for two years.[5] This letter seems to have been written by Adelard in Sicily, since it is prefaced with a dedication to William, bishop of Syracuse, and since towards its close Adelard speaks of "coming from Salerno into Graecia maior" [1]—a phrase by which he presumably refers to the ancient Magna Graecia, or southern Italy, and perhaps also Sicily. In the preceding year, however, Adelard and his nephew had been together in Tours.[2] It thus appears that the *De eodem* was written not very long after Adelard set out on his quest for foreign learning, while he was still in the Greek or semi-Greek learned society of southern Italy and Sicily, and presumably before he had come into contact with the science of the Saracens, which he does not mention in the *De eodem et diverso,* although traces of it undoubtedly lingered in Sicily. He writes as if the idea had only comparatively recently come to him "that he could much broaden his education, if he crossed the Alps and visited other teachers than those of Gaul."

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[1] Haskins (1911) pp. 492-3.

[2] It is true that after 1109, "The queen herself, who had for a time accompanied the movements of her husband, now resided mostly at Westminster" (G. B. Adams in Hunt and Poole, *Political History of England,* II, 151), so that Adelard would not have had many opportunities to play before her in the English possessions across the channel after that date.

[3] *De eodem et diverso,* pp. 25-6, Philosophy addresses Adelard, ". . . cum praeterito anno in eadem musica Gallicis studiis totus sudares adessetque in serotino tempore magister artis una cum discipulis cum eorum reginaeque rogatu citharam tangeres."

[4] P. 3, line 16, "Quoniam autem in epistola hac . . ."; line 25, "Hanc autem epistolam 'De eodem et diverso' intitulavi"; p. 34, line 7, "Vale; et utrum recte disputaverim, tecum dijudica."

[5] P. 3, line 9, "Nam et ego, cum idem metuens iniustae cuidam nepotis mei accusationi rescribere vererer, in hanc demum sententiam animum compuli, ut reprehensionis metum patienter ferrem, accusationi iniustae pro posse meo responderem.

P. 4, line 6, "Saepenumero admirari soles, nepos, laboriosi itineris mei causam et aliquando acrius sub nomine levitatis et inconstantiae propositum accusare . . ."; line 17, "Et ego, si tibi idem videtur, causam erroris mei—ita enim vocare soles—paucis edisseram et multiplicem labyrinthum ad unum honesti exitum vocabo . . ."; line 22, "Ego rem, quam per biennium celavi, ut tibi morem geram aperiam. . . ."

P. 34, line 3, "Hactenus, carissime nepos, tibi causam itineris mei per diversarum regionum doctores flexi satagens explicavi, ut et me injustae accusationis tuae onere alleviarem et tibi eorundem studiorum affectum applicarem. . . ."

Different situation depicted in the *Natural Questions.*

In the *Natural Questions,* on the other hand, he returns to England after seven years, instead of a single year, of separation from his nephew, after a visit to the principality of Antioch,[3] and after a considerable period of study among the Saracens or Arabs. It is rather natural, however, to conclude that the same absence abroad is referred to in both treatises, and that Adelard wrote *De eodem et diverso* to his nephew after he had been absent a year, while the *Natural Questions* was composed after his return at the end of seven years. Thus six years would separate the two treatises. But the *Natural Questions* depicts a different last parting of uncle and nephew from that of *De eodem et diverso.* It does not allude to their having been together in

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[1] P. 33, line 13, ". . . a Salerno veniens in Graecia maiore . . ."; also p. 32, line 27, "Quod enim Gallica studia nesciunt, transalpina reserabunt; quod apud Latinos non addisces, Graecia facunda docebit."

[2] P. 4, line 25, "Erat praeterito in anno vir quidam apud Turonium . . . et te eius probitas non lateat, qui una ibi mecum adesses."

[3] *Quest. nat.,* cap. 51, "Cum semel in partibus Antiochenis pontem civitatis Manistre transires, ipsam pontem simul etiam totam ipsam regionem terre motu contremuisse." It is true that this remark is put into the nephew's mouth, but it is probably meant to refer to an incident of Adelard's recent trip abroad and not to some previous one.

Tours seven years ago, but reminds the nephew how, when his uncle took leave of him and his other pupils at Laon seven years since, it was agreed between them that while Adelard investigated Arabian learning, his nephew should continue his studies in Gaul.[1] In the *De eodem et diverso,* on the contrary, neither Laon nor the Arabs nor any such agreement between uncle and nephew is mentioned. Rather, the uncle seems to have at first kept secret the motives for his crossing the Alps. It therefore may be that Adelard had returned from Sicily to Gaul and had taught at Laon for a short time before setting out on a longer period of travel in quest of Arabian science. This would agree well enough with his allusion to his nephew in the *De eodem et diverso* as "still a boy," [2] and the statement in the *Natural Questions* that his nephew was "little more than a boy" [3] when he parted from him seven years before. In this case the *Natural Questions* would have been written more than seven years after the *De eodem et diverso.* This is, I think, the most tenable and plausible hypothesis.

Some apparent indications that the *De eodem et diverso* was written after the *Natural Questions.*

There are, it is true, one or two circumstances which might be taken to indicate that the *De eodem et diverso* was written after the *Questiones naturales.* In the sole manuscript of the *De eodem* thus far known [4] it follows that treatise, and its title *Of the same and different* might be taken as a continuation with variations of the general line of thought of the other treatise. But it is perhaps just because some copyist has so interpreted its title that it is put after the *Natural Questions* in this manuscript. At any rate in the text itself Adelard gives another explanation of its title, stating that it has reference to the allegorical figures, Philosophia and Philocosmia, who address him in his vision, and who, he says, are designated as *eadem* and *diversa* "by the prince of philosophers,"—an allusion perhaps to some of Aristotle's pronouns.[1] Another curious circumstance is that the problem, How far would a stone of great weight fall, if dropped in a hole extending through the earth at the center? occurs in both the *De eodem* and *Natural Questions*.[2] In the latter the nephew puts the query to his uncle: in the former a Grecian philosopher whom Adelard has been questioning concerning the properties of the magnet in attracting iron, in his turn asks Adelard this question. Now in the *Natural Questions* Adelard's answer is given, as if the nephew had never heard it before, but in the *De eodem et diverso* it is simply stated that the Greek "listened to my explanation of this," as if the nephew had already heard the explanation from his uncle.[3]

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[1] *Quest. nat., proemium,* "Meministi, nepos, septennio iam transacto, cum te in gallicis studiis pene puerum iuxta laudisdunum una cum ceteris auditoribus meis dimiserim, id inter nos convenisse ut arabum studia pro posse meo scrutarer, te vero gallicarum sententiarum in constantiam non minus acquireres?

(Nepos) Memini eo quoque magis quod tu discedens philosophie attentum futurum me fidei promissione astringeres."

[2] *De eodem,* p. 4, line 10, "cum in pueritia adhuc detinearis." In this treatise, too, Adelard himself is regularly spoken of as *iuvenis,* which is, however, an exceedingly vague word.

[3] "pene puerum"

[4] Latin MS 2389, a twelfth century parchment, of the Bibliothèque Nationale, Paris. The *Questiones naturales* end at fol. 82v, whence the *De eodem et diverso* continues to fol. 91v. The manuscript is described by Willner at p. 37 of his edition of the *De eodem et diverso.*

How long had Henry I been reigning?

In opening the *Natural Questions* Adelard states that Henry I was reigning when he returned to England recently. This statement, in Professor Haskins' opinion, "would seem to imply that he originally left England for his studies in France before Henry's accession." I am not quite sure that this inference follows, but if it does, may one not go a step further and argue that Henry I had come to the throne since Adelard parted from his nephew at Laon to investigate the learning of the Arabs? Had Henry become king of England while Adelard was still studying or teaching in northern Gaul, he would almost certainly have heard of it, and it would have been no news to him on his return from his studies among the Arabs. If we accept this view, Adelard's return to England would be not later than 1107. But it could scarcely be earlier, if he wrote and dedicated the *Natural Questions* promptly after his arrival, of which he speaks as a recent event in that work, since the dedicatee did not become Bishop of Bayeux until 1107. And if the *De eodem et diverso* was written more than seven years before the *Natural Questions,* we should have to date it back into the eleventh century, which would perhaps be too early for its dedication to William, bishop of Syracuse. And to put these two works so early is to leave a gap between them and the other known dates of Adelard's career, 1126, 1130, and 1142-1146, and make the period of his literary productivity quite a long one. He would have been quite a graybeard when he wrote on the astrolabe for the juvenile Henry Plantagenet. On the whole, therefore, I am inclined to think that Henry I had been reigning for some time when Adelard wrote the *Natural Questions.*

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[1] P. 3, line 25ff. "Hanc autem epistolam 'De eodem et diverso' intitulavi, quoniam videlicet maximam orationis partem duabus personis, philosophiae scilicet atque philocosmiae attribui, una quarum eadem, alter vero diversa a principe philosophorum appellatur." Adelard fails to explain why the title is not *De eadem et diversa*, as his explanation might seem to require.

[2] *Quest. nat.*, cap. 49; *De eodem et diverso*, p. 33.

[3] In both treatises Adelard regards the stars as divine animals, as we have seen, and refers to the same partition of the head among the mental faculties in both (*Quest. nat.*, cap. 18; *De eodem*, p. 32) but there is nothing to indicate which passage is prior.

CHAPTER XXXVII

WILLIAM OF CONCHES

His relation to his time—Early life—Writings—*Philosophia:* general character—Contemporary education—Good and bad demons—Astronomy and astrology—Extent of the influence of the stars—Science and religion—Letter of William of St. Thierry to St. Bernard—Extent of William's retraction in the *Dragmaticon*—Reassertion of previous views—No denial of science—William's future influence—Appendix I. Editions and Manuscripts of the Original and of the Revised Version of the Work of William of Conches on Natural Philosophy.

". . . rejoicing not in the many but in the probity of the few, we toil for truth alone."

—Philosophia (1531) p. 28.

His relation to his time.

PRACTICALLY contemporary with Adelard of Bath and associated like him with members of the English royal line was William of Conches,[1] of whom we shall treat in the present chapter. Like Adelard also he withdrew from the schools of Gaul after teaching there for a time—longer apparently than Adelard; like Adelard he followed the guidance of reason and took an interest in natural science; like him he employed the dramatic dialogue form in his works. John of Salisbury, who studied grammar under William of Conches and Richard Bishop (*l'Évêque*) from about 1138 to 1141,[2] represents those masters as successors to the thorough-going educational methods and humanistic ideals of Bernard of Chartres; but adds that later, when men "preferred to seem rather than be philosophers, and professors of the arts promised to transmit all philosophy to their hearers in less than three or two years' time, overcome by the onslaught of the unskilled multitude, they ceased teaching."[1] William then seems to have entered the service of Geoffrey Plantagenet, to whom as duke of Normandy as well as count of Anjou we find William addressing his *Dragmaticon* or *Dramaticus,* which takes the form of a dialogue between them. It thus was written at some time between 1144 and 1150, the period when Geoffrey was duke of Normandy.[2] His son, the future Henry II of England, was in Normandy from 1146 to 1149, when William appears to have been his tutor.[3] In the *Dragmaticon* William praises Geoffrey for training his children "from a tender age" in the study of literature,[4] and before the boy was made duke of Normandy by his father in 1150 at the age of seventeen William prepared for his perusal a collection of moral extracts from such classical Latin authors as Cicero, Seneca, Juvenal, Horace, Lucan, and Persius, entitled *De honesto et utili.*[5] The last we hear of William seems to be in 1154, under which date Alberic des Trois

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[1] On William of Conches see, besides HL XXI, 455 *et seq.* and DNB, Antoine Charma, *Guillaume de Conches*, Paris, 1857; B. Hauréau, in his *Singularités historiques et littéraires*, Paris, 1861; H. F. Reuter, *Geschichte der religiösen Aufklärung im Mittelalter,* II (1877) pp. 6-10; R. L. Poole, *Illustrations of the History of Medieval Thought,* 1884, pp. 124-31, 338-63, (or, 1920, pp. 106-12, 293-310) and "The Masters of the Schools at Paris and Chartres in John of Salisbury's Time," EHR, 35 (1920) pp. 321-42. For editions and MSS of the original version and revision of William's chief philosophical treatise see Appendix I at the close of this chapter. For his other works see my subsequent foot-notes.

[2] *Metalogicus* II, 10.

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[1] *Metalogicus,* I, 24.

[2] Haskins, *Norman Institutions,* 1918, p. 130. Haskins, *Ibid.,* p. 205, has found no authority for Geoffrey's absence on crusade in 1147, so that it need not be taken into account in dating the *Dragmaticon.*

[3] R. L. Poole, in EHR (1920) p. 334.

[4] R. L. Poole (1884), p. 348, (1920) p. 299, concluded from this, "The dialogue was written therefore some time, probably some years, before Henry was of an age to be knighted, in 1149; and we shall certainly not be far wrong if we place it about the year 1145." As, however, Henry was knighted when only about sixteen, and as the remark "quos . . . studio literarum tenera aetate imbuisti" may be retrospective, and as one can scarcely argue with any chronological exactness from these medieval phrases denoting time of life—Henry, for example, is addressed as "vir optime atque liberalis" in the preface of the collection of ethical maxims which William made for him before he was seventeen,— it seems to me that there is no sufficient reason for fixing on 1145 as the date of the *Dragmaticon.*

[5] Printed in Migne, PL 171, 1007-56, among the works of Hildebert of Le Mans. William's authorship was determined by Hauréau, *Notices et Extraits,* XXXIII, i, 257-63.

Fontaines,[1] a thirteenth century chronicler, states that he had attained a great reputation. He might well have lived on for some time after that date, since his former associate, Richard Bishop, was archdeacon of Coutances at the time John of Salisbury wrote the *Metalogicus* in 1159, and survived to become bishop of Avranches in 1171, dying only in 1182. One infers, however, from John's account that William was no longer living in 1159.

Early life.

We may next look back upon the earlier events of William's life. In the *Dragmaticon* he speaks of having been previously engaged in teaching "for twenty years and more than that." Still earlier he had been a student, presumably under Bernard of Chartres, in which town it is possible that much of his own teaching was done. John of Salisbury, however, simply says of his studies with William, "Straightway I betook me to the grammarian of Conches," while in another passage he mentions "my teachers in grammar, William of Conches and Richard, surnamed Bishop, now an archdeacon at Coutances." Although this passage might seem to suggest that William taught at Conches, no one so far as I know has ever entertained that supposition, and the chief dispute has been whether he taught at Chartres or at Paris.[2] But that he was born at Conches no one doubts, and he himself once speaks somewhat satirically of his Norman dulness compared to the lightning intelligences of some of his contemporaries.[3]

Writings.

The *Dragmaticon* was a revision of a work on philosophy or natural philosophy composed in William's "younger days."[4] He also appears to have commented upon Boethius' *Consolation of Philosophy*,[5] and to have written a gloss on the *Timaeus*[1] in which among other things he dilates upon the perfection of certain numbers. But our discussion will be almost exclusively concerned with his much more influential *Philosophia* and its revised version, *Dragmaticon*. We shall first examine the original version.[2]

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[1] Bouquet, *Recueil*, XIII, 703D.

[2] R. L. Poole, in EHR (1920) p. 334, decides in favor of Chartres.

[3] Cited from the *Dragmaticon* by Poole (1884) pp. 348-9, (1920) 300.

[4] *In iuventute nostra*, another example of a vague chronological phrase.

[5] Charles Jourdain, *Des Commentaires inédits de Guillaume de Conches et de Nicolas Triveth sur la Consolation de la Philosophie*, Paris, 1861.

Philosophia: general character.

The original treatise touches on the fields of philosophy and astronomy in a simple and elementary way, but with considerable skill, if not originality, in the selection and presentation of its subject-matter. William does not seem acquainted with Arabic science except that he has read Constantinus Africanus and from him derived the same doctrine that the four elements are never found in a pure state which we met in Adelard of Bath. William gives us a Platonic interpretation of nature, in which nevertheless he does not adhere at all closely to the *Timaeus*, interspersed with not infrequent quotation from or reference to astronomical works, classical literature, and the Bible and church fathers. Indeed, he is always careful to allow for divine influence in nature and for the statements of Scripture, and to show that his theories do not contradict either. In such passages his language is always reverent, and he not infrequently alludes respectfully to what the saints have to say (*sancti dicunt*) on the theme in hand. The body of the treatise opens with definition of philosophy and statement of its method of inquiry, after which the author argues that the world was made by God and discusses the Trinity at some length. He then discusses the topics of world-soul, demons, and elements; next passes to various matters astronomical and astrological concerning the sky and stars; and finally treats of our lower world and of man.

Contemporary education.

The work also contains, especially in the prefaces to its different books but also in other passages, a number of interesting allusions to contemporary learning and education. William frequently refers to the existence of other scholars and furthermore makes it evident that this learned society is not in its earliest stage. Its paradise period is over; the evil has entered in among the good; the enemy has sown tares amid the wheat. Education has become too popular, and already the insincere and the incapable, the charlatan and the unthinking mob, are cheapening and degrading the ideals of the true philosopher. William speaks of "many who usurp the name of teacher," [1] and of "certain men who have never read the works either of Constantinus or of any other philosopher, who out of pride disdain to learn from anyone, who from arrogance invent what they do not know," [2] and who actually insist that the four qualities, hot, cold, moist, and dry, are elements. In another passage William says, "Although we are aware that many strive for an ornate style, few for accuracy of statement, yet rejoicing not in the many but in the probity of the few, we toil for truth alone." [3] These are not all of William's complaints. Back in the world of feudalism, crusades, and Holy Roman Empire which seems to many so foreign, distant, and incomprehensible, he voices grievances which are still those of the college or university professor of to-day. The teacher is so occupied with classes that he has little time for research and publication; [4] the vulgar crowd has stolen philosophy's clothing and left the essential body of truth naked and vainly crying for covering,—a figure borrowed from *The Consolation of Philosophy* of Boethius without express acknowledgment,[5] but perhaps the allusion was so familiar as not to require one; the truly learned are in danger of the bite of envy; most teachers are catering to their pupils and giving "snap courses" in order to gain popularity; the elective system is a failure, since the students, in the words of the Apostle, "after their own lusts heap to themselves teachers having itching ears"; academic freedom has become a thing of the past now that masters are become flatterers of their students and students judges of their masters, while "if there is anyone who does maintain a magisterial air, he is shunned as if insane by the meretricious scholars and is called cruel and inhuman." [1] All which agrees perfectly with John of Salisbury's statement why William had ceased teaching.

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[1] Printed in part as by Honorius of Autun in Cousin, *Ouvrages inédits d'Abélard*, Appendix, p. 648, *et seq.*

[2] My references will be to the *editio princeps* of Basel, 1531, which is, however, not particularly accurate.

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[1] Edition of 1531, p. 1.

[2] *Ibid.*, p. 14.

[3] *Ibid.*, pp. 27-8.

[4] *Ibid.*, p. 51.

[5] The parallel passages are: *De consolatione philosophiae*, I, i, 21-3 and I, iii, 19-28. It will be recalled that William wrote a commentary on Boethius' work.

Good and bad demons.

William does not mention magic in his treatise, but the fact that he does not condemn all demons indifferently is perhaps worth noting as a departure from the usual patristic view and as offering opportunity for an innocent variety of necromancy. William, who attributes his classification to Plato, distinguishes three sorts of demons. The first class, existent in the ether betwixt firmament and moon, are rational, immortal, ethereal animals, invisible and impassive, whose function is blissful contemplation of the divine sun. The second class, who dwell in the upper atmosphere near the moon, are rational, immortal, aerial animals. They communicate the prayers of men to God and the will of God to men, either in person or through signs or dreams and "by the closest aspiration of vocal warning." They are capable of feeling, and, devoting themselves to good men, rejoice in their prosperity and suffer with them in their adversity. Both of these first two classes of demons are good,—*kalodaemones*. But the third class, who inhabit the humid atmosphere near the earth and are rational, immortal, watery animals, and capable of feeling, are in every way evil,—*kakodaemones*. They are lustful, cohabit with women, and envy and plot against mankind, for men, although fallen from grace like these demons, can recover their lost estate as the demons cannot.[2]

Astronomy and astrology.

William offers a rather novel and unusual explanation of the difference in meaning between the terms "astronomy" and "astrology," stating that authorities on the subject speak of the superior bodies in three ways, the fabulous, the astrological, and the astronomical. The method by fable is that employed by Aratus, Memroth (Nimrod the astronomer?), and Hyginus ("Eginus"), who interpret the Greek myths in an astronomical sense. Hipparchus and Martianus Capella are representatives of the astrological method, which treats of phenomena as they appear to exist in the heavens, whether they are really so or not. Astronomy, on the contrary, deals with things as they are, whether they seem to be so or not. Exactly what he has in mind by this distinction William fails to make any clearer as he proceeds, but from the fact that he lists Julius Firmicus and Ptolemy as instances of the astronomical method it would appear that he included part at least of what we should call astrology under "astronomy." William cites yet other astronomical authorities, advising anyone wishing to learn about the Milky Way to read Macrobius, and for an explanation of the signs of the zodiac to consult Helpericus (of Auxerre), the ninth century compiler of a *Computus* which occurs with fair frequency in the manuscripts.[1]

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[1] Ed. of 1531, p. 65.

[2] *Ibid.*, pp. 9-10.

Extent of the influence of the stars.

William represents "Plato, most learned of all philosophers," as saying that God the Creator entrusted the task of forming the human body to the stars and spirits which He had first created, but reserved to Himself the making of the human soul.[2] This Christian interpretation or rather perversion of Plato's doctrine in the *Timaeus* is characteristic. William accepts to the full the control of the stars over nature and the human body, but stops there. Like Adelard he states that the stars are composed of the same four elements as earthly objects. The predominance in their composition of the superior elements, fire and air, accounts for their motion. Their motion heats the atmosphere which in turn heats the element water, which is the fundamental constituent in the various species of animals, which further differ according to the admixture in them of the other elements. Of the superior elements the birds of the air have the most, and fish next. Of land animals choleric ones, like the lion, possess most fire; phlegmatic ones, like pigs, most water; and melancholic ones, like the cow and ass, most earth. The human body is composed of an unusual harmony of the four elements, to which Scripture alludes in saying that "God formed man of the dust of the earth."[1] William also lists the natural qualities and humors of each planet and its consequent influence for good or evil. He believes that the ancient *astrologi* discovered that Saturn is a cold star by repeatedly observing that in those years when the Sun in Cancer burned the earth less than usual, Saturn was invariably in conjunction with it in the same sign. How Saturn comes to exert this chilling influence William is less certain. He has already denied the existence of the congealed waters above the firmament, so that he cannot accept the theory that Saturn is cold because of its proximity to them. He can only suggest that its great distance from us perhaps explains why it heats less than the other planets.[2] The good and evil influences of the planets also come out in the astrological interpretation of myth and fable. Thus Saturn is said to carry a scythe because one who carries a scythe does more execution in receding than in advancing. Jupiter is said in the fables to have ousted his father Saturn because the approach of the planet Jupiter increases the evil influence of Saturn. Jupiter is said to have begotten divers children in adultery because the conjunctions of that planet produce varied effects upon earth; and Venus is said to have had adulterous intercourse with Mars because the propinquity of the planet Venus to the planet Mars renders the former less benevolent. Mars is god of battle because the planet of that name produces heat and drought which in their turn engender animosity.[3] As the tides follow the phases of the moon, so, William believes, a universal flood or conflagration may be produced by the simultaneous elevation or depression of all the planets.[1] But he accepts comets as special signs of the future caused by the Creator's will instead of attempting to give a natural explanation of the events which follow them.[2] This is perhaps because of their signifying human events. Thunder and lightning are discussed without mention of divination from them.[3]

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[1] Ed. of 1531, pp. 30-32.

[2] *Ibid.*, preface.

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[1] Ed. of 1531, pp. 24-25, ". . . et hoc est quod divina pagina dicit deum fecisse hominem de limo terrae."

[2] *Ibid.*, p. 34.

[3] *Ibid.*, pp. 36-7.

Science and religion.

Thus far we have heard William cite authorities rather than spurn them as Adelard did. He could, however, be independent enough on occasion. He went so far as to reject the Scriptural account of waters above the firmament, if that word were taken in its ordinary astronomical sense, as naturally impossible; he explained away the passage in *Genesis* by interpreting the firmament to mean the air, and the waters above it, the clouds.[4] Like Adelard, too, he several times feels it essential to justify his views against the possible criticism of an obscurantist religious party. Discussing the Trinity, he insists that if anyone finds something in his book which is not found elsewhere, it should not on that account be stigmatized as heresy but only if it can be shown to be against the Faith.[5] Thus he confirms Adelard's complaint that the present generation is prejudiced against any modern discoveries. William, by the way, also employs the word "modern." Again, in affirming the physical impossibility of reconciling the elements fire and earth, he notes that someone may object that God could find a way. To this he replies that "we do not place a limit upon divine power, but we do say that of existing things none can do it, nor in the nature of things can there be anything that would suffice." [6] In a third passage his indignation is fanned to a white heat by those who say, "We do not know how this is, but we know that God can do it." "You poor fools," he retorts, "God can make a cow out of a tree, but has He ever done so? Therefore show some reason why a thing is so, or cease to hold that it is so." [7] Elsewhere he yet further dilates upon the unreasonableness of the opponents of natural science, who are loath to have explained even the natural facts given in the Bible but prefer to accept them blindly, and who, "since they themselves are unacquainted with the forces of nature, in order that they may have all men as companions in their ignorance, wish them to investigate nothing but to believe like rustics. We, on the contrary," continues William, "think that a reason should be sought in every case, if one can be found." [1] Thus he vigorously echoes Adelard's exhortation to give and take reason, and his retort to the nephew's suggestion that the growth of plants from earth can be explained only as a divine miracle.

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[1] Ed. of 1531, p. 64.
[2] *Ibid.*, p. 60.
[3] *Ibid.*, pp. 55-6.
[4] *Ibid.*, pp. 28-9.
[5] *Ibid.*, p. 7.
[6] *Ibid.*, p. 19.
[7] *Ibid.*, p. 29.

Letter of William of St. Thierry to St. Bernard.

William, it turned out, was too original and bold in some of his assertions concerning the Trinity and kindred topics, which were not allowed to pass unchallenged. A letter to St. Bernard from William, abbot of St. Thierry,[2] shows the attitude of William of Conches' opponents. The abbot first says,—with the assumption of superior seriousness and dignity characteristic through all time of conservatives, bigots, and pompous persons subconsciously aware of their own stupidity—that anyone who knows William of Conches personally is aware of his levity and will not take his vanities too seriously, and that he is to be classed with Abelard in the presumptuousness of his opinions. The abbot then devotes most of his letter to an attack upon William's discussion of the Trinity, taking umbrage at his discussing questions of faith at all, especially upon a philosophical basis, and at his distribution of the three faculties, power, will, and wisdom, among the Three Persons. The abbot more briefly objects to William's physical account of the creation of man, saying: "First he says that man's body was not made by God but by nature, and the soul was given him by God afterwards, and forsooth that the body was made by spirits whom he calls demons and by the stars." This doctrine the abbot regards as on the one hand dangerously close to the opinion "of certain stupid philosophers who say that there is nothing but matter and the material, and that there is no other God in the world than the concourse of the elements and the system of nature"; and on the other hand as manifestly Manichean, affirming that the human soul is created by a good God but the body by the prince of darkness. Finally the abbot complains that William "stupidly and haughtily ridicules history of divine authority," and "interprets in a physical sense" the account of the creation of woman from one of Adam's ribs.

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[1] Ed. of 1531, p. 26.

[2] Migne PL 180, 333-40, *Guillelmi abbatis S. Theodorici De erroribus Guillelmi de Conchis ad sanctum Bernardum.*

Extent of William's retraction in the *Dragmaticon.*

The effect of this theological attack upon William of Conches can probably be discerned in the *Dragmaticon.* There he states that it is his purpose to include "many essential points" which were not contained in the earlier treatise, and to omit those statements which he has since become convinced are erroneous. He then proceeds to list and expressly condemn certain statements in the earlier work as contrary to the Catholic Faith, and he asks those readers who have copies of that treatise to make these corrections in it.[1] He accordingly retracts his assertion that in the Trinity the Father represents power and the Holy Spirit will, since there is no direct scriptural authority for this view, but he still maintains that the Son is Wisdom on the authority of the Apostle. He takes back his interpretation of the words of the Prophet concerning Christ, "Who will tell his generation?" as indicating merely the difficulty and not the impossibility of solving that mystery. Finally he reverts to the letter of Scripture in regard to the creation of Eve.

Reassertion of previous views.

But this done, William becomes his old self again in the remainder of the *Dragmaticon.* In the rôle of the philosopher he argues at length with the duke whether Plato's five circles of the sky and division of spirits into *kalodaemones* and *kakodaemones* is in agreement with the Christian Faith. Later on, when the duke cites Bede against him in regard to some astronomical point, he replies that in a pure matter of faith he would feel obliged to accept Bede's authority, but that on a point of philosophy he feels perfectly at liberty to disagree with him. This declaration of scientific independence from patristic authority became a *locus classicus* cited with approval by several writers of the next century. Presently to our surprise we find William boldly inquiring at what time of year the six days of creation occurred. He also indulges as before in somewhat bitter reflections upon the learned world of his day.

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[1] This was the impression that I received from the text in CLM 2595 rather than that "His former work, therefore, he suppressed and begged everyone who possessed the book to join him in condemning and destroying it";—R. L. Poole (1884) p. 130, (1920) p. 110.

No denial of science.

William, therefore, has had to withdraw some theological opinions for which he could not show authority in Scripture, and some other opinions wherein he disregarded the literal meaning of the Bible. But except that he has to agree to the miraculous account of the creation of the first woman, he does not seem to have altered his views concerning nature and philosophy, nor to have given up in any way his scientific attitude or his astrological theories. The theologians have forced him to conform in respect to theology, but his retraction in that field takes the form of a second edition of his treatise and a reaffirmation of his astronomical and philosophical views. As Hauréau well says, "He always believes in science, he still defends in the name of science, in the accents, and by the method of the scholar, everything in his former writings that has not been condemned in the name of the Faith. . . . So it is no denial of philosophy that has been won by the outcries of William of St. Thierry and Walter of St. Victor; [1] those attacks have resulted in merely intimidating the theologian." [2]

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[1] Walter, in an attack upon the views of Abelard, Gilbert de la Porrée, and others, unjustly accused William of holding the Epicurean atomic theory; Poole (1884) pp. 349-50, (1920) pp. 300-1.

[2] B. Hauréau, *Histoire de la philosophie scolastique*, ed. of 1872, I, 445.

William's future influence.

Such attacks, moreover, had little or no success in lessening William's ultimate future influence. How utterly they failed to intimidate astrologers may be inferred from the much greater lengths to which William's contemporary, Bernard Silvester, went without apparently getting into any trouble, and from the half-hearted arguments against the art of John of Salisbury a little later in the century. As Doctor Poole has already pointed out, even the *Philosophia,* which William of St. Thierry censured and which William of Conches himself modified, survived in its original and unexpurgated version "to be printed in three several editions as the production of the venerable Bede, of saint Anselm's friend, William of Hirschau, and of Honorius of Autun; the taint of heresy plainly cannot have been long perceptible to medieval librarians."[1] Also the revised edition, or *Dragmaticon,* "enjoyed a remarkable popularity, and a wide diffusion attested by a multitude of manuscripts at Vienna, Munich, Paris, Oxford, and other places."[2] We shall find William's book much used and cited by the learned writers of the following century, and a number of copies of it are listed in the fifteenth century catalogue of the library of St. Augustine's Abbey, Canterbury. If then from the contemporary and passing world of talk William retired disgusted and discomfited to the shelter of ducal patronage, in the enduring world of thought and letters he carved for himself a lasting niche by his comparative intellectual courage, originality, and thoroughness.

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[1] R. L. Poole (1884) p. 130, (1920) p. 111.

[2] *Ibid.,* p. 131, (1920) p. 111.

APPENDIX I

EDITIONS AND MANUSCRIPTS OF THE ORIGINAL AND OF THE REVISED VERSION OF THE WORK OF WILLIAM OF CONCHES ON NATURAL PHILOSOPHY

Although, as the ensuing bibliography will make apparent, a variety of titles have been at one time or another applied to the two versions of the work in question, we shall refer to the original version as *Philosophia* and the revision as *Dragmaticon,* which appear to be both the handiest and the most correct appellations, although personally I should prefer *Dramaticus* for the latter. The two works may perhaps be most readily distinguished by their *Incipits,* which are, for *Philosophia,* "Quoniam ut ait Tullius in prologo rhetoricorum, Eloquentia sine sapientia . . .", and for *Dragmaticon,* "Quaeris, venerande dux Normannorum et comes Andagavensium, cur magistris nostri temporis minus creditur quam antiquis. . . ." The titles and the number of books into which the work is divided differ a good deal in different editions and manuscripts, and the catalogues of manuscript collections sometimes do not identify the author.

First as to printed editions. *Philosophia* has been printed three times as the work of three other authors.

Philosophicarum et astronomicarum institutionum Guilelmi Hirsaugiensis olim abbatis libri tres, Basel, 1531.

Bede, Opera, 1563, II, 311-43, *Περὶ Διδάξεὼν,* sive Elementorum Philosophiae Libri IV.

Honorius of Autun, De philosophia mundi, Migne, PL vol. 172.

Dragmaticon seems to be have been printed but once under the title,

Dialogus de substantiis physicis confectus a Guillelmo aneponymo philosopho, Strasburg, 1567.

In the following list of MSS, which is no doubt far from complete, I have attempted to distinguish between the *Philosophia* and *Dragmaticon* but have often had to rely only upon the notices in catalogues which frequently do not give the opening words or other distinguishing marks. The following MS seems unusual in apparently containing both versions, if by "eiusdem philosophia secunda" is indicated the *Dragmaticon*.

CLM 564, 12th century, with figures, fol. 1-, Willelmi de Conchis philosophiae libri IV, fol. 32-, eiusdem philosophia secunda.

MSS of the Philosophia

Egerton 935, 12th century, small quarto, Phylosophia Magistri Willihelmi de Conchis, cum figuris.

Egerton 1984, 13th century, fols. 2-33.

Royal 9-A-XIV, 14th century, fols. 245-65, Physicorum libri 4.

Royal 13-A-XIV, #7, "Quoniam ut ait Tullius. . . ."

Additional 11676, 13th century, anon. de philosophia naturali, in three parts.

Additional 26770, 13-14th century.

Digby 104, 13th century, fol. 176-, De elementis philosophiae naturalis.

University College 6, 14th century, p. 389, Philosophiae compendium, "Quoniam ut ait Tullius. . . ."

Bodleian (Bernard) 2596, #10, in four parts; 3623, #30, fol. 187v-; 4056, #1.

BN 6656, 14th century, Philosophia, in four parts; 15025; 13th century; 16207, 13th century, fol. 58-.

Ste. Geneviève 2200, anno 1277, fols. 1-47, with colored figures, "Quoniam ut ait Tullius. . . ."

Vienna 2376, 12th century, fols. 32v-64v, "Incipit prologus in phylosophyam Willehelmi. Quoniam ut ait Tullius. . . ."

Amplon. Octavo 85, 13th century; Octavo 87, mid 12th century!

CLM 2594, 13th century, fol. 24, Compendium philosophie de naturis corporum celestium et terrenorum. Sunt libri IV.

CLM 2655, late 13th century, fol. 106, "Summa de naturis videlicet totius philosophiae," in fine nonnulla desunt.

CLM 14156, 15th century, fols. 1-18, Philosophia minor.

CLM 14689, 12th century, fols. 85-7, Wilhelmi Hirsaugiensis dialogus de astronomia, supersunt tria tantum folia.

CLM 15407, 14th century, fols. 1-42, philosophia.
CLM 16103, 12-13th century, fols. 68-99, philosophia naturalis.
CLM 18918, 12th century, fols. 1-34, de philosophia.
CLM 22292, 12-13th century, fol. 40, "Quoniam ut ait Tullius. . . ."

MSS of the Dragmaticon

CLM 2595, 13th century, 43 fols. Dragmaticus.
CLM 7770, 14th century, 56 fols. De secunda philosophia.
Florence II, VI, 2, 13th century, fols. 50-65, "Queris venerande dux. . . ."
Ashburnham (Florence) 98, 13th century, fols. 2-41.
Bibl. Alex. (Rome) 102, 14-17th century, fols. 112-209.
Wolfenbüttel 4610, 12-14th century, fols. 78-160v, Phisica Willendini, "Queris venerande dux. . . ."
Berlin 921, 13th century.
Vienna 5292, 15th century, fols. 105-57, "Veros (*sic*) Venerande dux. . . ."
Vendôme 189, 13th century, fols. 123-59.
St. John's 178, early 13th century, fols. 266-360, anon., "Queris venerande dux. . . ."
Corpus Christi 95, end 12-13th century, fol. 1, Universalis Philosophiae libri tres per modum dialogi inter Normannorum ducem et ipsum doctorem.
Digby 1, 14th century, fol. 1, Dragmaticon.
Digby 107, 14th century, Summa magistri Wilhelmi de Conches super naturalibus questionibus et responsionibus, "Queris venerande dux. . . ." The catalogue incorrectly speaks of it as a dialogue with Henry, duke of Normandy, afterwards Henry II of England.
Bodleian (Bernard) 3565.
Royal 4-A-XIII, #5, Philosophia naturalis, "Queris," etc.
Royal 12-F-X, 13th century.
Arundel 377, 13th century, fol. 104.
Sloane 2424, 14th century.
Additional 18210, 13-14th century.
Egerton 830, 15th century, Dialogus de philosophia inter Henricum II (*sic*) Normannorum ducem et ipsum auctorem. . . .
BN 6415, 14th century; and 4694.
Montpellier, École de Méd. 145.
Troyes 1342.

CHAPTER XXXVIII

SOME TWELFTH CENTURY TRANSLATORS, CHIEFLY OF ASTROLOGY FROM THE ARABIC IN SPAIN

Importance of medieval translations—Plan of this chapter—Transmission of Arabic astrology—Walcher, prior of Malvern—Pedro Alfonso—His letter to the Peripatetics—Experimental method—Magic and scepticism in the *Disciplina clericalis*—John of Spain—Dates in his career—Further works by him, chiefly astrological—John's experimental astrology—Gundissalinus *De divisione philosophiae*—Place of magic in the classification of the sciences—Al-Farabi *De ortu scientiarum*—Gundissalinus on astrology—Robert Kilwardby *De ortu sive divisione scientiarum*—Plato of Tivoli—Robert of Chester—Hermann the Dalmatian—Hugh of Santalla—A contemporary memorial of Gerard of Cremona—Account by a pupil of his astrological teaching—Character of Gerard's translations—Science and religion in the preface to a translation of the *Almagest* from the Greek—Arabs and moderns—Astronomy at Marseilles—Appendix I. Some medieval Johns, mentioned in the manuscripts, in the fields of natural and occult science, mathematics and medicine.

Importance of medieval translations.

Already we have treated of a number of Arabic works of occult science which are extant in Latin translations, or have mentioned men, important in the history of medieval science like Constantinus Africanus or Adelard of Bath, whose works were either largely or partly translations. In future chapters we shall have occasion to mention other men and works of the same sort. We have already seen, too, that translations from the Greek were being made all through the early middle ages and in the tenth century; and we shall see this continue in the twelfth and thirteenth centuries especially in connection with Galen, Aristotle, and Ptolemy. We have also seen reasons for suspecting that the Latin versions of certain works were older than the so-called Greek originals, that works were sometimes translated from Arabic into Greek as well as from Greek into

Arabic, and that there probably never were any Arabic originals for some so-called translations from the Arabic which are extant only in Latin. All this is not yet to mention versions from Hebrew and Syriac or in French, Spanish, and Anglo-Saxon. We have seen also in general how important and influential in the history of medieval learning was the work of the translator, and yet how complicated and difficult to follow. Many names of translators are mentioned in the medieval manuscripts: some, for instance, who will not be treated of in the present chapter are: from the Greek, Aristippus of Sicily, Bartholomew of Messina, Burgundio of Pisa, Eugenius admiral of Sicily, Grumerus of Piacenza, Nicolaus of Reggio, Stephen of Messina, and William of Moerbeke; from the Arabic, Egidius de Tebaldis of Parma, Arnold of Barcelona, Blasius Armegandus or Ermengardus of Montpellier, Marcus of Toledo, the canon Salio of Padua, John Lodoycus Tetrapharmacus, Philip of Spain, Philip of Tripoli, Roger of Parma, Ferragius, and so on. But not all such names of translators can be correctly placed and dated, and many translations remain anonymous in the manuscripts. Into this vast and difficult field Jourdain's work on the medieval translations of Aristotle made but an entrance, and that one which now needs amendment, and even such extensive bibliographical investigations as those of Steinschneider have only made rough charts of portions. Some detailed monographs on single translators [1] and the like topics have been written, but many more will be required before we shall have a satisfactory general orientation.

Plan of this chapter.

The subject of medieval translations as a whole of course in any case lies in large part beyond the scope of our investigation and would lead us into other literary and learned fields not bearing upon experimental science and magic. In the present chapter we shall further limit ourselves to some translators of the twelfth century who chiefly translated works of astrology from the Arabic and who, although they themselves often came from other lands, were especially active in Spain. One or two men will be introduced who do not possess all these qualifications, but who are related to the other men and works included in the chapter.

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[1] Especially by Professor C. H. Haskins, who has corrected or supplemented Steinschneider and others on various points, and who has other studies in preparation in addition to those to be mentioned in ensuing footnotes of this chapter.

Transmission of Arabic astrology.

Throughout the twelfth century from its first years to its close may be traced the transit of learning from the Arabic world, and more particularly from the Spanish peninsula, to northwestern Europe. Three points may be made concerning this transmission: it involves Latin translation from the Arabic; the matter translated is largely mathematical, or more especially astronomical and astrological in character; finally, it is often experimental.

Walcher, prior of Malvern.

On the very threshold of the twelfth century, in addition to Adelard of Bath to whom we have given a separate chapter, we meet with another Englishman, Walcher, prior of Malvern, whom we find associated with Peter Alphonso or Pedro Alfonso, who apparently was a converted Spanish Jew. Walcher's experimental observations would seem to have antedated his association with Pedro, since a chapter headed, "Of the writer's experience,"[1] in lunar tables which he composed between 1107 and 1112, tells of an eclipse which he saw in Italy in 1091 but could not observe exactly because he had no clock (*horologium*) at hand to measure the time, and of another in the succeeding year after his return to England which he was able to observe more scientifically with the aid of an astrolabe. In 1120 Walcher translated into Latin, at least according to the testimony of the manuscripts, an astronomical work by Pedro Alfonso on the Dragon.[2] Pedro perhaps wrote the original in

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[1] The passage is reproduced by C. H. Haskins, "The Reception of Arabic Science in England," EHR 30, 57, from Bodleian Auct. F-i-9 (Bernard 4137), fols. 86-99.

[2] In the MS mentioned in the preceding note, "Sententia Petri Ebrei cognómento Anphus de dracone quam dominus Walcerus prior Malvernensis ecclesie in latinam transtulit linguam;" Haskins, *Ibid.*, p. 58. I also note in Schum's *Verzeichniss*, Amplon, Quarto 351, 14th century, fols.

Hebrew or Spanish or translated it from the Arabic into one of those languages, but we also know of his writing in Latin himself.

Pedro Alfonso.

This Pedro Alfonso seems to have been the same [1] who in 1106 in his forty-fourth year was baptized at Huesca with the name of his godfather, King Alfonso I of Aragon, and who wrote the *Disciplina clericalis* and *Dialogi cum Iudeo*. Indeed we find the *Disciplina clericalis* and *De dracone* ascribed to him in the same manuscript.[2] In another manuscript chronological and astronomical tables are found under his name and the accompanying explanatory text opens, "Said Pedro Alfonso, servant of Jesus Christ and translator of this book." [3] This expression is very similar, as Haskins has pointed out, to a heading in a manuscript of the *Disciplina clericalis*, "Said Pedro Alfonso, servant of Christ Jesus, physician of Henry the first (*sic*) king of the Angles, composer of this book." [4] The experimental pretensions and astrological leanings of the astronomical treatise are suggested by Pedro's statement that the

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15-23, the *De dracone* of Petrus Alphonsus with a table, translated into Latin by "Walter Millvernensis prior." After two intervening tracts concerning the astrolabe by another author the same MS contains "Alfoncius," *De disciplina clericali*.

[1] But not the same apparently as an Alfonsus of Toledo, to whom Steinschneider (1905) p. 4, has called attention, and who translated a work by Averroes (1126-1198) preserved in Digby 236, 14th century, fol. 190. Its prologue speaks of an abridgement of the Almagest by Averroes which Alfonso the Great (presumably Alfonso X or the Wise of Castile, 1252-1284) had had translated and which was in circulation in Spain and at Bologna. From the Explicit of the same treatise one would infer that two Alfonsos were engaged in its translation, one a son of Dionysius of Lisbon, and the other a convert, who became a sacristan at Toledo:—"*et iste tractatus translatus fuit a magistro Alfonsio Dionysii de Ulixbona Hispano apud Vallem Toleti, interprete magistro Alfonso converso, sacrista Toletano.*" The treatise is followed at fol. 194v by a "Narration concerning Averroes and the Saracen king of Cordova," which opens, "This is worth knowing which was told me by Alfonso, a trustworthy Jew, physician of the king of Castile."

[2] Amplon. Quarto 351, as noted in note 2 on the preceding page.

[3] Corpus Christi 283, late 12th century, fols. 113-44, "Dixit Petrus Anfulsus servus Ihesu Christi translatorque huius libri . . .", quoted by Haskins, EHR 30, 60.

[4] CU Ii, vi, 11, fol. 95. "Dixit Petrus Amphulsus servus Christi Ihesu Henrici primi regis Anglorum medicus compositor huius libri"; quoted by Haskins, *Ibid.*, 61. Pedro would hardly have called Henry "first", so the heading is perhaps not entirely genuine.

science of the stars divides into three parts, marvelous in reasoning, notable in the signification of events, and approved in experience; and that the third part is the science of the nature of the spheres and stars, and their significations in earthly affairs which happen from the virtue of their nature and the diversity of their movements, things known by experiment.

His letter to the Peripatetics.

In a manuscript at the British Museum[1] I have read what seems to be a third astronomical treatise by Pedro Alfonso, differing both from the preceding and from the *De dracone*.[2] We meet as before the expression, "Said Alfonso, servant of Jesus Christ and translator of this book,"[3] and the emphasis upon experiment and astrology continues. It will be noted further that in this treatise, which takes the form of a letter to Peripatetics and those nourished by the milk of philosophy everywhere through France, Pedro is no longer connected with Englishmen, although this manuscript, too, is in an English library. After rehearsing the utility of grammar, dialectic, and arithmetic, Pedro finally comes to astronomy, an art with which "all of the Latins generally" are little acquainted, in which he himself has long been occupied, and a portion of which he presents to them as something rare and precious. It has come to his ears that some seekers after wisdom are preparing to traverse distant provinces and penetrate to remote regions in order to acquire fuller astronomical knowledge, and he proposes to save them from this inconvenience by bringing astronomy to them. Apparently, therefore, this letter to the Peripatetics and other students of philosophy is simply the advertisement of, or preface to, a translation by Pedro of some astronomical or astrological work, presumably from the Arabic.[1] It is accordingly mainly devoted to a justification of the thorough study of astronomy and astrology. Many persons, in Pedro's opinion, are simply too lazy to take the trouble to ground themselves properly therein. Those who think they know all about the subject because they have read Macrobius and a few other authors are found wanting in a crisis,—a passage meant doubtless as a hit at those who base their knowledge of astronomy simply upon Latin authors. Pedro also alludes to those who have been accustomed to regard themselves as teachers of astronomy and now hate to turn pupils again.

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[1] Arundel 270, late 12th century, fols. 40v-44v, Epistola de studio artium liberalium praecipue astronomiae ad peripateticos aliosque philosophicos ubique per Franciam.

[2] So far as I can judge from Professor Haskins' description of and brief excerpts from them; he does not notice the Arundel MS.

[3] This occurs at fol. 43r in the midst of the treatise; at the beginning, in addressing the Peripatetics and other philosophers and students throughout France, the writer calls himself, "*Petrus Anidefunfus*, servant of Jesus Christ, and their brother and fellow student."

Experimental method.

The contrast which Pedro draws, however, is not so much between Latin and Arabic writings as it is between dependence upon a few past authorities and adoption of the experimental method. He argues that the principles of astronomy were discovered in the first place only through experimentation, and that today no one can understand the art fundamentally without actual observation and experience. He believes that astrology as well as astronomy is proved by experience. "It has been proved therefore by experimental argument that we can truly affirm that the sun and moon and other planets exert their influences in earthly affairs." [2] Or, as he says in another passage, "And indeed many other innumerable things happen on earth in accordance with the courses of the stars, and pass unnoticed by the senses of most men, but are discovered and understood by the subtle acumen of learned men who are skilled in this art." [3] Pedro's letter further includes some astrological medicine, interesting in connection with the statement in another manuscript that he was the physician of Henry I of England. In this context, too, he shows familiarity with the translations from the Arabic of Constantinus Africanus.[1]

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[1] See fol. 42v, "Ceterum in nostro translationis inicio prologum dictare curavimus de veritate videlicet artis."

[2] Fol. 44v, "Probatum est ergo argumento experimentali quod re vera possumus affirmare solem et lunam aliosque planetas in terrenis viras (*sic*) suas exercere." A little further along on the same page he employs the same phrase again, "Ostensum est quod eodem experimentali argumento. . ."

[3] Fols. 44v-45r, "Multa quidem alia et innumerabilia iuxta syderum cursus in terra contingunt atque vulgarium sensus hominum non attingit, prudentium vero atque huius artis peritorum subtile acumen penetrat et cognoscit."

Magic and scepticism in the *Disciplina clericalis.*

Pedro's *Disciplina clericalis,*[2] although a collection of oriental tales rather than a work of natural science,[3] contains one or two passages of interest to us. Asked by a disciple what the seven arts are, the master gives a list somewhat different from the common Latin *trivium* and *quadrivium,* namely, logic, arithmetic, geometry, physics, music, and astronomy. As to the seventh there is some dispute, he says. Philosophers who believe in divination make necromancy the seventh; other philosophers who do not believe in predictions substitute philosophy; while persons who are ignorant of philosophy affirm that grammar is one of the seven arts.[4] Thus while Pedro retains all four arts of the *quadrivium,* he holds only to logic in the case of the *trivium,* omitting rhetoric entirely and tending to substitute physics and necromancy for it and grammar. This tendency away from *belles-lettres* to a curriculum made up of logic and philosophy, mathematical and natural science, also soon became characteristic of Latin learning, while the tendency to include necromancy as one of the liberal arts or natural sciences, although less successful, will be found in other writers who are to be considered in this chapter. In the passage just discussed the importance of the number seven also receives emphasis, as the master goes on to speak of other sevens than the arts. One is impressed also in reading the *Disciplina clericalis* by a sceptical note concerning magic and the marvelous properties of natural objects, as in the tale of the thief who repeated a charm seven times and tried to take hold of a moonbeam, but as a result fell and was captured, and in the tale of the Churl and the Bird, who promised his captor, if released, to reveal three pieces of wisdom.[1] The first was not to believe everyone. "This saide," in the quaint wording of the medieval English version, "the litel brid ascendid vpon the tree and with a sweete voice bigan to synge: 'Blessid be god that hath shit and closed the sight of thyn eyen and taken awey thi wisdam, forwhi if thow haddest sought in the plites of myn entrailes thow shuldest have founde a jacinct the weight of an vnce.'" When the churl wept and beat his breast at this announcement of his lost opportunity, the bird again warned him not to be so credulous. "And how belivistow that in me shuld be a jacynt the weight of an vnce, whan I and al my body is nat of somoche weight?"

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[1] Fol. 41v, "sicut Constantinus in libro suo quem de lingua saracena transtulit in latinam testatur."

[2] The most recent edition of the Latin text is A. Hilka and W. Söderhjelm, *Petri Alfonsi Disciplina Clericalis,* 1911. An English version from a 15th century MS in Worcester Cathedral was edited by W. H. Hulme in *The Western Reserve University Bulletin,* 1919.

[3] In the preface (Hulme's translation, p. 13) Pedro says, "I have composed this little book partly from the sayings and warnings of the philosophers, partly from Arabic proverbs and admonitions both in prose and verse, and partly from fables about animals and birds."

[4] *Discip. cleric.,* I, 9.

John of Spain.

Apparently the chief and most voluminous translator of astrological works from Arabic into Latin in the twelfth century was John of Spain.[2] Although he translated some other mathematical, medical, and philosophical treatises, the majority of his translations seem to have been astrological, and they remained in use during the later middle ages and many of them appeared in print in early editions. So many Johns[3] are mentioned in medieval manuscripts and even wrote in almost the same fields as John of Spain that it is not easy to distinguish his works. Jourdain identified him with a John Avendeath or Avendehut (Joannes ibn David) who worked with the archdeacon Gundissalinus under the patronage of Raymond, archbishop of Toledo from 1126 to 1151.[4] John of Spain was perhaps not the man who worked with Gundissalinus[5] but he certainly appears to have addressed translations to Archbishop Raymond. Thus in speaking of Costa ben Luca's *De differentia spiritus et animae* we saw that the manuscripts stated that it was translated by John of Spain from Arabic into Latin for Archbishop Raymond of Toledo.[1] John of Spain is further styled of Luna or Limia, in one manuscript as bishop of Luna,[2] and also seems to be the same person as John of Toledo or of Seville. In one of the citations of the *Speculum astronomiae* of Albertus Magnus he is called "Joannes Ulgembus Hispalensis." [3] John Paulinus, who translated a collection of twelve experiments with snake-skin entitled *Life-saver* which he discovered when he "was in Alexandria, a city of the Egyptians," is in at least one manuscript of his translation identified with John of Spain.[4]

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[1] *Discip. cleric.*, XVII, 48.

[2] The fullest list of his translations that I know of is in Steinschneider (1905) pp. 41-50.

[3] See Appendix I at the close of this chapter for a list of some of them.

[4] Jourdain (1819) pp. 113 *et seq.*, 449.

[5] A difficulty is that John of Spain's translations are usually described as direct from the Arabic and nothing is said of Gundissalinus, whereas in the preface to

Dates in his career.

Certain dates in the career of John of Spain may be regarded as fairly well fixed. In the Arabic year 529, or 1135 A. D., he translated the *Rudiments of Astronomy* of Alfraganus (Ahmed b. Muh. b. Ketîr el-Fargânî, or Al-Fargani)[5]; in 1142 A. D. he compiled his own *Epitome of*

Avicenna's *De anima* John Avendeath tells the archbishop that he has translated it word for word from Arabic into Spanish, and that Dominicus Gundisalvus has then rendered the vernacular into Latin: Steinschneider (1893) pp. 981 and 380, note 2; J. Wood Brown (1897) p. 117; Karpinski (1915) pp. 23-4. But perhaps John learned Latin as time passed. However, as far as I know, there is no MS where John of Spain is definitely called John Avendeath or *vice versa.*

[1] For example, S. Marco X-57, 13th century, fols. 278-83; Avranches 232, 13th century; BN 6296, 14th century, # 15.

[2] Amplon. Quarto 365, 14th century, fols. 100-19, Liber Haomar de nativitatibus in astronomia . . . quem transtulit mag. Iohannes Hyspalensis et Lunensis epyscopus ex Arabico in Latinum. "Bishop" is omitted in Digby 194, 15th century, fol. 127v, "Perfectus est liber universus Aomar Benigan Tyberiadis cum laude Dei et eius auxilio quem transtulit magister Johannes Hispalensis atque Limensis de Arabico in Latinum." Likewise in CU Clare College 15 (Kk. 4. 2), c. 1280 A. D., fol. 64v.

[3] *Spec. astron.*, cap. 2.

[4] Arundel 251, 14th century, fol. 35v, "Cum ego Johannis hyspanicus. . . ."

Steinschneider (1905) p. 51, lists "Johannes Pauli, oder Paulini," as distinct from John of Spain. I shall treat of the *Salus vitae* in a later chapter on "Experiments and Secrets of Galen, Rasis and Others: II. Chemical and Magical." See below, chapter 65, page 794.

[5] Printed in 1497, 1537, and 1546 as *Brevis ac perutilis compilatio* or *Rudimenta astronomiae.* Digby 190, 13-14th century, fol. 87, gives the Arabic year as 529, while its 1173 should obviously not be A. D. but of the Spanish era. Corpus Christi 224 gives the Arabic year as 528, and the era date has been

the Art of Astrology or *Quadripartite Work of Judgments of the Stars,*[1] consisting of *Isagoge in astrologiam* and four books of judgments. In 1153 A. D. he translated the *Nativities* of Albohali [2] (Yahyâ b. Gâlib, Abû Alî el-Chaiyât), if we accept the "John of Toledo" who is said to have translated that treatise as the same person as our John of Spain.[3] John of Spain is sometimes said to have died in

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altered to clxx. m. (1170), probably from mclxxiii (1173), the initial 'm' dropping out, and the final 'iii' in consequence being misread by a copyist as 'm.' The same careless copyist has perhaps dropped an 'i' from the arabic year. In BN 6506 and 7377B, according to Jourdain (1819) pp. 115-6, the Arabic year is 529, but the other 1070, a further error. I suppose this is the same treatise as the *Liber in scientia astrorum et radicibus motuum celestium* or *Theoria planetarum et stellarum* of *"El-Fargânî"* which Sudhoff (1917) p. 27, following J. Brinkmann, *Die apokryphen Gesundheitsregeln des Aristoteles,* 1914, says John of Toledo translated into Latin in 1134.

[1] *Epitome totius astrologiae conscripta a Ioanne Hispalensi Hispano astrologo celeberrimo ante annos quadringentos ac nunc primum in lucem edita. Cum praefatione Ioachimi Helleri Leucopetraei contra astrologiae aduersarios. Noribergae in officina Ioannis Montani et Ulrici Neuber, Anno Domini M.D.XLVIII.* The date 1142 is given at fol. 18r and at the close, fol. 87v.

Steinschneider (1905), p. 41, "im Jahre 1142 kompilierte er, nach arabischen Mustern, eine *Epitome totius astrologiae,* ed. 1548, deren Teile (*Isagoge* und *Quadripart.*) mit besonderen Titeln vielleicht in einzelnen mss. zu erkennen wären."

In the 14th century MSS, S. Marco XI-102, fols. 107-31, and XI-104, fols. 1-30, the title is "epitome artis astrologiae." Vienna 5442, 15th century, fols. 158r-79v, Opus quadripartitum de iudiciis astrorum, has the same Incipit, "Zodiacus dividitur in duodecim. . . ." See also Amplon. Octavo 84, 14th century, fols. 1-37, and Quarto 377, 14th century, fols. 7-11, Iudicia Iohannis Hispalensis, and BN 7321, 1448 A. D., fols. 122r-154v, "Incipiunt ysagoge Iohannis Hyspalensis cum parte astrologie iudiciali."

[2] Laud. Misc. 594, 14-15th century, fols. 94-106, Liber Albohali de nativitatibus translatus a Johanne Toletano. "Perfectus est liber Nativitatis mense Julii anno ab Incarnatione Domini millesimo cliii cum laude Dei et ejus auxilio."

CU Clare College 15 (Kk. 4, 2), c. 1280 A. D., fols. 39-47, does not name the translator but gives the date as 1153, and the same MS, fols. 24-9, contains John of Spain's translations of a work on the astrolabe in 40 chapters, of treatises by Messahalla at fols. 48-55, and Aomar at fols. 56-64.

Royal 12-C-XVIII, 14th century, fols. 2-9v, ends incomplete, but a colophon added in another hand gives the date as 1152.

The work was printed at Nürnberg, 1546.

There is a different translation of it, made by Plato of Tivoli in 1136 A. D., in Cotton Appendix VI, fol. 163-, Aubueli liber in judiciis nativitatum quem Plato Tiburtinus ex Arabico sumpsit Ao. Arabum 530 et alexandri 1447 in civitate Barkelona.

[3] Steinschneider ascribes the translation of Albohali to John of Spain; the Catalogue of the Royal Manuscripts says that Johannes Toletanus is possibly the same as John of Spain. Sudhoff

1157, but Förster argued that the Tarasia, queen of Spain, to whom the medical portion of the pseudo-Aristotelian *Secret of Secrets,* translated by John of Spain, was dedicated, was not the queen of Portugal contemporary with Archbishop Raymond of Toledo, but queen of Leon from 1176 to 1180; and in 1175 a monk of Mt. Tabor is called Johannes Hispanus.[1] If a Vienna manuscript is correct in saying that a marvelous cure for a sore heel which it contains was sent to Pope Gregory by John of Spain, the pope meant must be Gregory VIII (1187).[2] There is of course no impossibility in the supposition that the literary career of John of Spain extended from the days of Archbishop Raymond to those of Gregory VIII or Queen Tarasia. Still there is some doubt whether all the works extant under the name John of Spain were composed by the same individual.[3]

Further works by him, chiefly astrological.

Several books dealing with the science of judgments from the stars by John of Spain are included in the bibliography of deserving works of astrology in the *Speculum Astronomiae* of Albertus Magnus, but are perhaps simply sections of his *Epitome*[4] which, after discussing in the

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(1917), p. 17, identifies "Johann von Toledo (Hispanus, Avendehut)."

Perhaps, however, the John of Toledo to whom a treatise entitled, *De conservanda sanitate,* is ascribed in two 14th century MSS at Paris, BN 6978, # 1 and 16222, fol. 76-; also Berlin 905, 15th century, fol. 74-; CU Gonville and Caius 95, 15th century, fol. 283-; was not the same person.

Rose, in the Berlin MSS catalogue, identifies this last John of Toledo with a John David of Toledo who in 1322 joined with other astrologers in issuing a threatening circular letter predicting terrible events for the year 1329. See Amplon. Quarto 371 for another such letter for the year 1371, and Amplon. Octavo 79 for tables of conjunctions of the sun and moon for the years 1346-1365 by a John of Toledo.

[1] R. Förster, *De Aristotelis quae feruntur physiognomonicis recensendis,* Killiae, 1882, pp. 26-27; J. Wood Brown (1897), 35; HL XXX, 369.

[2] Vienna 5311, 14-15th century, fol. 41v.

[3] A work that I have not before seen ascribed to him is, Perugia 683, 15th century, fols. 393-6, "Incipit summa magistri Iohannis yspani super arborem de consanguineitate."

Steinschneider fails, I think, to note in his list of John's translations an "introductio de cursu planetarum" (St. John's 188, late 13th century, fol. 99v-) which he translated from Arabic into Latin at the request of two "Angligenarum, Gauconis scilicet et Willelmi."

[4] However, the *Incipits* given by Albert do not agree very well with those of the sections of the *Epitome* in the printed text of 1548. See chapter 42 for the re-

Isagoge the natures of the signs and planets, takes up in turn the four main divisions of judicial astrology, namely; conjunctions and revolutions, nativities, interrogations, and elections. John seems to have translated several astrological treatises by Albumasar and Messahala (Mâ-sâ-allâh), the treatise by Thebit ben Corat on astrological images of which we have already treated, that by Abenragel ('Alî b. abî'l-Rigâl, abû'l-Hasan) on elections, and the *Introduction to the Mystery of Judgments from the Stars* by Alchabitius or Alcabitius[1] ('Abdel'azîz b. 'Otmân el-Qabîsî), which should not be confused with his own somewhat similar *Ysagoge*. Of other translations by John of Spain, such as a portion of the *Secret of Secrets* of the Pseudo-Aristotle, the twelve experiments with pulverized snake-skin, and Costa ben Luca's *De differentia spiritus et animae*, we treat elsewhere. He was perhaps also the author of a chiromancy.[2]

John's experimental astrology.

The experimental character of John's own handbook on astrology is worth noting. In the main, it is true, he follows the works of the philosophers and astrologers of the past, especially when he finds them in agreement.[3] Besides constantly alluding to what astrologers in general or the ancients say on the point in question, he often cites of the Greeks Ptolemy and Dorotheus ("Dorothius") and Hermes and Doronius, but probably through Arabic mediums. He also gives us the views of the masters of India, and dis-

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semblance between this printed text and a treatise in MS ascribed to Roger of Hereford.

[1] Arundel 268, 13-14th century, fols. 7v-23r, Abdolaziz Arabis libellus ad judicium astrorum introductorius qui dicitur Alkabitius, interprete Johanne Hispalensi.

S. Marco XI-104, 14th century, fols. 79-102, Alcabitii ad iudicia astrorum interpretatum a Iohanne Hispalensi.

BN 7321, 1448 A. D., fols. 1-79r, Introductorium ad magisterium iudiciorum astrorum.

[2] S. Marco XI-105, 14th century, fols. 54-61, "Cyromancia est ars demonstrans mores et inclinationes naturales per signa sensibilia manuum." Valentinelli comments, "Eadem fortasse cum chiromantia Ioannis Hispalensis quam inter codices manuscriptos Ioannis Francisci Lauredani Tomasinus refert."

[3] *Epitome*, II, xx, "Iam radicem nativitatis secundum philosophorum dicta complevimus nec edidimus nisi ea in quibus sapientes convenerunt et ex quibus experimentum habetur."

tinguishes as "more recent masters of this art"[1] the Arabic writers "Alchindus" and Messahala. The latter he seems to regard as an Indian or at least as skilful in their methods of judgment.[2] But he also notes when his authorities are in disagreement[3] or points out that his own experience in many nativities contradicts their views,[4] against which John's readers are warned when they find them in the books of judgments. Even Ptolemy is twice criticized on the basis of actual experiment.[5] We see that John was not merely a translator or writer on astrology but an expert practitioner of the art. He supplements the divergent views of past authorities, or qualifies their consensus of opinion, by his own apparently rich experience as a practicing or experimental astrologer. Indeed, for him the theory and practice of the art, the paths of reason and experience, are so united that he not merely speaks of "this reasoning" or view as being "tested by experience,"[6] but seems to employ the words *ratio* and *experimentum* somewhat indiscriminately for astrological tenet or technique.[7]

Gundissalinus *De divisione philosophiae.*

The chief known work of Gundissalinus, the archdeacon who was for a time perhaps associated with John of Spain in the labor of translation, is his *De divisione philosophiae,*[8] a treatise which owes much to the Turkoman Al-Farabi (Muh. b. Muh. b. Tarchân b. Uzlag, Abû Nasr, el-Fârâbî). If Baur is right in thinking that Gundissalinus made use of translations by Gerard of Cremona, 1114-1187, in the *De divisione philosophiae,*[1] it would appear to be a later work than his translating for Archbishop Raymond, 1130-1150, which perhaps began as early as 1133.[2]

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[1] *Epitome,* III, viii, "Iuniores huius artis magistri dicunt posse inveniri locum thesauri absconditi quod veteres discreti omiserunt. . . ."

[2] *Ibid.,* "Messehala autem Indorum in iudiciis solertissimus dicit. . . ."

[3] *Epitome,* III, xii, " . . . in quaestione autem quis victurus astrologi discordati sunt. . . ."

[4] *Epitome,* II, x, "Sed expertum est in nativitatibus multis hoc abrogari etiam cum omnes rationes praedictae simul convenerint cuius rei meminimus ne in libris inveniendo fidem daremus."

[5] The passage just quoted in the preceding note continues, "Porro Ptolemaeus dicit . . . sed experti sumus multoties hoc non recipi." See also the following chapter of the *Epitome,* II, xi.

[6] *Epitome,* II, xxii, ". . . et est ratio experimentata haec. . . ."

[7] See III, xii, where, after stating the discordant views of astrologers he says, "Hanc vero postremam rationem experimentis caeteris preponimus."

[8] Ed. Ludwig Baur, in *Beiträge,* IV, 2-3, Münster, 1903, pp. 1-144 text; pp. 145-408 "Untersuchung." Another work by Gundissalinus on the immortality of the soul was published in the same series by G. F. von Hertling, 1897.

Baur unfortunately failed to note the existence of the *De divisione philosophiae* in two 13th century MSS at the British Museum in the Sloane collection, nor does Scott's Index catalogue of the Sloane MSS mention Gundissalinus as their author.

Sloane 2946, 13th century, fols.

Place of magic in the classification of the sciences.

In the classification and description of the sciences which make up the bulk of the *De divisione philosophiae* Gundissalinus gives a certain place to the occult arts. At the beginning of the book, it is true, the magic arts are not classed among useful things of the spirit like the virtues and true sciences *(honestae scientiae)*. Neither, however, are they grouped with pride, avarice, and vain glory as harmful vices, but are merely classed along with worldly honors as van-

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209-16, "de philosophia . . . auctore Isaaco philosopho." But the Incipit, "Felix prior aetas qui (quae) tot sapientes . . ." is that of Gundissalinus' treatise. The erroneous ascription to Isaac is probably owing to the fact that the treatise just preceding, at fols. 205-208v, is a translation of a medical work by Isaac. This MS is mutilated towards the close so that the leaves containing our text have the upper right hand corner torn off, thus removing nearly one-sixth of the text. The colophon reads, "Explicit hoc opus a domino Gundissalini apud Tholetum editum, sdens (succedens?) de assignanda causa ex qua orte sunt scientie philosophie et ordo eorum et disciplina." Similarly in Baur's text the *De divisione philosophiae* at pp. 1-142 is followed at pp. 142-44 by Alfarabi's "Epistola de assignanda causa ex qua orte sunt scientie philosophie et ordo earum in disciplina."

Sloane 2461, late 13th century, fols. 1-38r, contains the *De divisione philosophiae* under the caption, *Compendium scientiarum,* without indication of the author. It also is immediately followed at fols. 38v-40r by *De unitate,* which Baur found in another MS at the close of Gundissalinus' *De divisione philosophiae,* and in a third MS before the above mentioned letter of Alfarabi.

A MS now lost is, Library of St. Augustine's Abbey, Canterbury, 1175, Gundisalvus de ortu et divisione scientiarum.

Cotton Vespasian B-X, fols. 24-27, Alpharabius de divisione omnium scientiarum, is not the treatise of Gundissalinus, as I was at first inclined to suspect that it might turn out to be upon examination.

Alfarabi's *De scientiis* was published in his *Opera omnia* by Camerarius at Paris in 1638 from a MS which the preface represented as a recent discovery. Baur, p. viii, states that this text differs considerably from the Latin version by Gerard of Cremona, but that the borrowings of Gundissalinus from Alfarabi and the citations in Vincent of Beauvais' *Speculum doctrinale* agree with this 1638 text rather than with Gerard's.

[1] Baur (1903), p. 163.

[2] Karpinski (1915), p. 23.

ities.[1] "Nigromancy according to physics," however, is later listed as one of eight sub-divisions of natural science together with alchemy, medicine, agriculture, navigation, the science of mirrors, and the sciences of images and of judgments.[2] Gundissalinus was innocent, however, of any detailed knowledge of necromancy or indeed of any of the other sub-divisions except medicine. He explains that he has not yet advanced as far as these subjects in his studies.[3] He is manifestly simply copying an Arabic classification, probably from Al-Farabi's *De ortu scientiarum,* and one of which we find similar traces in other medieval Christian authors.[4]

Al-Farabi *De ortu scientiarum.*

This little treatise on *The Rise of the Sciences* by Al-Farabi, although it occupies only a leaf or two in the manuscripts and has only recently been printed,[5] is a rather important one to note, as other of its statements than its eight sub-divisions of natural science seem to be paralleled in medieval Latin writers. There seems, for instance, a resemblance between its attitude towards the sciences and classification of them and that of Roger Bacon in the *Opus Maius.*[6] Al-Farabi believes in God the Creator, as his opening words show, and he regards "divine science" as the end and perfection of the other sciences; "and beyond it investigation does not go, for it is itself the goal to which all inquiry tends." [7] At the same time Al-Farabi emphasizes the importance of natural science, adding its eight parts to the four divisions of the *quadrivium*—arithmetic, geometry, astrology, and music, and saying, "Moreover, this last (i. e. natural) science is greater and broader than any of those sciences and disciplines (or, than any of those disciplinary sciences)." We need a science, he says in effect, which deals inclusively with changes in nature, showing how they are brought about and their causes and enabling us to repel their harmful action when we wish or to augment them,—a science of action and passion.[1] This suggestion of applied science and of a connection between it and magic also reminds one of Roger Bacon, as does Al-Farabi's statement later that the beginning of all sciences is the science of language.

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[1] Baur, pp. 4-5.

[2] Baur, p. 20.

[3] Baur, p. 89.

[4] See Daniel Morley on the eight parts of astrology in chapter 42 below, p. 177.

[5] I have read it in two MSS at Paris, where, however, the text seems faulty: BN 6298, 14th century, fols. 160r-161v, and BN 14700, fols. 328v-330v. It opens, "Scias nihil esse nisi substantia et accidens et creatorem substantie et accidentis in secula." Printed in *Beiträge,* xix.

[6] For Bacon's views see below, chapter 61.

[7] BN 6298, fol. 160v; BN 14700, fol. 330r. "Scientia divina que est finis scientiarum et perfectio earum. Et non restat post illam ulla inquisitio. Ipsa enim est finis ad quem tendit omnis inquisitio et in ea quiescit."

Gundissalinus on astrology.

Both for Al-Farabi and Gundissalinus the sciences of images and judgments were undoubtedly astrological. Gundissalinus himself believes that the spiritual virtue of the celestial bodies is the efficient cause, ordained by the Creator, of generation, corruption, and other natural operations in this corporeal world. He defines *astrologia* as we would astronomy, while he explains that *astronomia* is the science of answering questions from the position of the planets and signs. There are many such sciences,—geomancy, hydromancy, aeromancy, pyromancy, chiromancy, and augury; but astronomy is superior to the rest because it predicts what will befall upon earth from the dispositions of the heavenly bodies. Gundissalinus also repeats Isidore's distinction between *astronomia* and *astrologia,* and between the natural and superstitious varieties of "astronomy." [2]

Robert Kilwardby, *De ortu sive divisione scientiarum.*

At this point it may be well to note briefly a later work with a very similar title to that of Gundissalinus, namely, the *De ortu sive divisione scientiarum* of Robert Kilwardby,[3] archbishop of Canterbury from 1272 to 1279. The work borrows a great deal from Isidore, Hugh of St. Victor, and Gundissalinus. One of its more original passages is that in which Kilwardby suggests an alteration in Hugh's division of the mechanical arts, omitting theatrical performances as more suited to Gentiles than Catholics, and arranging the mechanical arts in a *trivium* consisting of earth-culture, food-science, and medicine, and a *quadrivium* made up of costuming, armor-making, architecture, and business-courses *(mercatura)*, after the analogy of the seven liberal arts.[1] Kilwardby, as has been already noted elsewhere, repeats Hugh's classification of the magic arts.[2]

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[1] "Et imo opus erat (fuit) scientia que hoc totum ostendit scilicet per quam veniremus ad huiusmodi permutationis scientiam (perveniremus ad scientiam huius permutationis) qualiter fiat et que sint eius actiones nocentes (occasiones et cause et quomodo possemus removere has occasiones nocentes) cum vellemus repellere et quomodo cum vellemus possemus eas augere. Hec igitur scientia fuit scientia de naturis que est scientia de actione et passione." The passages in parentheses are the variant readings in one of the two MSS.

[2] For the passages cited in this paragraph see Baur, 6, 115, 119-21.

[3] Baur, who lists MSS of the work at p. 368 and presents an analysis of it at pp. 369-75, gives the title as *De ortu et divisione philosophiae,* but the two 13th century MSS at Oxford, Balliol 3 and Merton 261, seem to prefer the form which I have given. I

Plato of Tivoli.

Next in importance to John of Spain as a translator of Arabic astrology in the first half of the twelfth century should probably be ranked Plato of Tivoli. They seem to have worked independently and sometimes to have made distinct translations of the same work, as in the case of the *Nativities* of Albohali and the *Epistle* of Messahala. On the whole, Plato's translations[3] would appear slightly to antedate John's. Haskins has shown, however, that the date 1116, hitherto assigned for Plato's translation of the *Liber embadorum* of Savasorda, should be 1145.[4] But Plato's translation of Albohali is dated 1136, while John's was not made until 1153.[5] In 1136 is also dated Plato's translation of the astrological work of Almansor in the form of one hundred and fifty or so brief aphorisms, judgments, propositions, or *capitula*, which later appeared repeatedly in print. Two years later he turned the famous *Quadripartitum* of Ptolemy into Latin. His other translations include Albucasis (Abû'l-Qâsim Chalaf b. 'Abbâs el-Zahrâwî) on the astrolabe, Haly ('Alî b. Ridwân b. 'Alî b. Ǧa'far, Abû'l-

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have looked through the text in Balliol 3, a beautifully written MS, but, in view of Kilwardby's date, scarcely of the early 13th century, as it is described in the catalogue. Hauréau regarded the work as clear, accurate, and worth printing.

[1] Cap. 40.

[2] Cap. 67.

[3] Listed by Steinschneider (1905), pp. 62-6.

[4] C. H. Haskins, in EHR (1911), 26, 491 note.

[5] See page 75 of this chapter, note 2.

Hasan) on nativities, and a geomancy. Most of Plato's translations were produced at Barcelona.

Robert of Chester.

In a manuscript at the British Museum[1] one of Plato of Tivoli's translations is immediately preceded in the same large clear hand, different from the smaller and later writing employed in the remainder of the manuscript, by a translation of the *Judgments* of the astrologer Alkindi by Robert of Chester,[2] with an introduction to "my Hermann," whom Robert commends highly as an astronomer. A letter written in 1143 by Peter the Venerable to St. Bernard tells how in 1141 he had induced two "acute and well trained scholars," who were then residing in Spain near the river Ebro, to turn for a time from the arts of astrology which they had been studying there, and to translate the Koran. These two translators were the friends whom we have just mentioned, Hermann of Dalmatia and Robert of Chester. Robert, too, tells us in the prefatory letter to the translation of the Koran, completed in 1143, that this piece of work was "a digression from his principal studies of astronomy and geometry." Besides such mathematical treatises as his translations of the *Judicia* of Alkindi, the Algebra of Al-Khowarizmi, a treatise on the astrolabe ascribed to Ptolemy, and several sets of astronomical tables, including a revision or rearrangement of Adelard of Bath's translation of the Tables of Al-Khowarizmi, Robert on February 11, 1144, translated a treatise on alchemy which Morienus Romanus, a monk of Jerusalem, was supposed to have written for "Calid, king of Egypt," or Prince Khalid ibn Jazid, a Mohammedan pretender and patron of learning at Alexandria. Of it we shall treat more fully in another chapter. About 1150 we seem to find Robert returned to his native England and writing at London.[3]

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[1] Cotton, Appendix VI.

[2] For the biography and bibliography of Robert of Chester see L. C. Karpinski, *Robert of Chester's Latin Translation of the Algebra of Al-Khowarizmi*, New York, 1915, especially pp. 26-32; C. H. Haskins, *The Reception of Arabic Science in England*, EHR 30 (1915), 62-5; Steinschneider (1905), pp. 67-73.

[3] Karpinski (1915), pp. 26, 29-30.

Hermann the Dalmatian.

Hermann the Dalmatian, or twelfth century translator, must be distinguished on the one hand from Hermann the Lame who wrote on the astrolabe,[1] and apparently on the other hand from Hermann the German who translated Averroes and Aristotle in the thirteenth century.[2] To the twelfth century translator we may ascribe such works as a treatise on rains,[3] a brief glossary of Arabic astronomical terms,[4] and Latin versions of the *Planisphere* of Ptolemy,[5] of the astrological *Fatidica* of Zahel,[6] and of the *Introduction to*

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[1] See above, chapter 30, I, 702-3. Besides the articles of Clerval and Haskins there mentioned we may note A. A. Björnbo, *Hermannus Dalmata als Uebersetzer astronomischer Arbeiten*, in *Bibliotheca Mathematica*, VI (1903), third series, pp. 130-3.

[2] Steinschneider (1905), pp. 32-5. He says, "Hermannus Alemannus, oder Teutonicus, Germanicus, soll um 1240-1260 Lehrer des Roger Bacon in Toledo (?) gewesen sein," but I do not know where he gets the notion that Hermann was Roger's teacher. The following works ascribed to Hermannus Theutonicus by Denifle (1886), p. 231,—and not mentioned by Steinschneider—seem to indicate another person of that name: "(41) fr. Hermannus Theutonicus de Cerwist (Zerbst) scripsit postillam super cantica; (50) fr. Hermannus Theutonicus scripsit librum de ascensu cordis. Item super Cantica. Item de arte precandi." In Vienna 2507, 13th century, fols. 85-123, an Ars dictandi is attributed to "Magistri Heremanni."

On the part taken by Hermannus Alemannus in the translation of Aristotle in the thirteenth century see further Grabmann (1916), pp. 208-12, 217-22, etc., where translations of his are connected with the dates 1240 and 1254.

[3] Clare College 15 (Kk. 4. 2), c. 1280 A.D., fols. 1-2r, Hermannus, liber imbrium, "Cum multa et varia de imbrium cognicione precepta Indorum tradat auctoritas . . . / . . . plerumque etiam imbres occurrunt set steriles" Iafar on rains immediately follows.

Vienna 2436, 14th century, fols. 134v-136v, "Cum multa et varia . . . / . . . eciam ymbres occurrant sed mediocres. Finitur Hermanni liber de ymbribus et pluviis."

Dijon 1045, 15th century, fols. 187-91 (following Hermann's translation of Albumasar), "de pluviis ab Hermano (de) Kanto (?) a judico in latinum translatus. Cum multa et varia de nubium cognicione . . . / . . . occurrunt sed steriles."

[4] In CUL 2022 (Kk. IV. 7), 15th century, fol. 116, however, such a short glossary preceding prognostications of famine is said to be "secundum Hermannum Teutonicum."

[5] Printed Basel, 1536; and Venice, 1558. J. L. Heiberg, *Claudii Ptolemaei Opera quae exstant omnia*, II, pp. clxxxiii-vi; Karpinski (1915), p. 32; Haskins (1915), p. 62; Suter (1914), p. ix.

[6] Or Sahl ben Biŝr ben Hânî, Abû 'Otmân. Steinschneider (1905), p. 34, and (1906) pp. 54-5, ascribes the translation to Hermann the Dalmatian; see, too, CUL 2022, 15th century, fols. 102r-115v, pronostica Zahel Iben Bixir, Hermanni secundi translatio. But in Digby 114, 14th century, fols. 176-99, "Explicit fetidica Zael Benbinxeir Caldei. Translacio hec mam. Gi. astronomie libri anno Domini 1138, 3 kal. Octobris translatus est."

Astronomy in eight books of the noted Arabic astrologer Albumasar, a work often entitled *Searching of the Heart* or *Of Things Occult*.[1] Hermann dedicated it to Robert of Chester, whom he also mentions in the preface of his translation of the *Planisphere*,[2] and in his chief work, the *De essentiis*, a cosmology which he finished at Béziers in the latter part of the same year 1143.[3]

Hugh of Santalla.

Hugo Sanctelliensis or Hugh of Santalla[4] is another translator of the first half of the twelfth century in the Spanish peninsula who appears to have worked independently of the foregoing men, since he to some extent translated the same works, for instance, the *Centiloquium* ascribed to Ptolemy, Latin versions of which have also been credited to Plato of Tivoli and John of Seville. Hugh's translations are undated but at least some of them may have antedated those of the men already mentioned,[5] since Haskins has identified Hugh's patron, "my lord, Bishop Michael," with the holder of the see of Tarazona from 1119 to 1151. Hugh's seven known translations are concerned with works of astronomy, astrology, and divination. Those on astrology include, besides the *Centiloquium* already mentioned, Albumasar's *Book of Rains,* Messahala on nativities, and a *Book of Aristotle from 255 volumes of the Indians,* of which we shall have more to say in the chapter on the Pseudo-Aristotle. The works on other forms of divination are a geomancy [1] and *De spatula,* a treatise on divination from the shoulder-blades of animals. In the preface to the geomancy he promises to treat next of hydromancy but says that he has failed to find books of aeromancy or pyromancy.[2] Although, as has been said, Hugh seems to have labored independently of the other translators and in a somewhat out-of-the-way town, he nevertheless seems to have felt himself in touch with the learning of his time. In his various prefaces, like William of Conches, he speaks of "moderns" as well as the arcana of the ancients,[3] and his patron is con-

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[1] Printed at Augsburg in 1489 and in other editions; it opens, "Astronomie iudiciorum omnium bispertita est via. . . ."

[2] Suter (1914), pp. xiii, xviii, interprets Hermann's words, "Quem locum a Ptolemaeo minus diligenter perspectum cum Albatene miratur et Alchoarismus, quorum hunc quidam opera nostra Latium habet, illius vero commodissima translatio Roberti mei industria Latinae orationis thesaurum accumulat," to mean that Robert translated Al-Battani, but in view of Robert's known translations of Al-Khowarizmi, I should translate *hunc* as "former" in this case and regard Hermann as the translator of Al-Battani.

[3] Professor Haskins wrote me on July 26, 1921, "The *De essentiis* is an interesting work of cosmology; when I am able to work it over more carefully I shall print the article on Hermann, now long overdue."

[4] The best treatment of Hugh is, C. H. Haskins, "The Translations of Hugo Sanctelliensis," in *The Romanic Review*, II (1911), 1-15, where attention is called to translations not noted by Steinschneider, and the prefaces of seven extant translations are printed.

[5] I cannot, however, agree with Professor Haskins (p. 10), that "From certain phrases in the preface" (of Hugh's translation of the *Liber Aristotilis de 255 indorum voluminibus*) "it would seem that, while Hugo has been for some time a devotee of Arabian science, he has only recently (*nunc*) and comparatively late in the day (*serus ac indignus minister*) entered the bishop's service." It seems to me that the last phrase should read *servus ac indignus minister*, for Hugh had already translated at least one other work for the bishop before this one on the 255 books of the Indians, and in the present preface he alludes to many previous discussions between them and to the bishop's continually exhorting him to publish, so that one would infer that they had been associated for some time past. Since writing this I have learned both from Mr. H. H. E. Craster of the Bodleian and from Professor Haskins himself that the reading in the MS (Digby 159, fol. 1v) is

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"seruus" or *servus,* as I have it in the rough notes I took on the treatise in August, 1919.

[1] The following MSS may be noted in addition to those (BN 7453 and Florence, Laur. II-85, Plut. 30, c. 29) listed by Steinschneider (1905), pp. 35-6, and Haskins (1911), p. 13.

CU Magdalene 27, late 14th century, fols. 1-66, "Ludus philosophorum qui apellatur filius (?) Astronomie. Rerum opifex deus qui sine exemplo nova condidit universa . . . Ego sanctelliensis geomantie interpretacionem (instead of inscriptionem as given by Haskins from BN 7453) ingredior et tibi mi domine tirasonensis antistes . . ." James adds, "On a Latin version of a tract of Apollonius, by Hugo Sanctelliensis in MS Bib. Nat. Lat. 14951, see F. Nau in *Revue de l'Orient Latin,* 1908," but in a note of 21 June 1921 Dr. James informs me that one should read *Orient Chrétien* in place of *Orient Latin.*

Vienna 5508, 14th century, fols. 182-200, Hugo Sacelliensis sive Saxaliensis, Geomantia, "Rerum opifex deus . . . / . . . sive mundus facie."

Vienna 5327, 15th century, fols. 59r-60v, Operis de geomantia ad Tirasconensem anstitem prologus et caput primum.

Haskins (1911), p. 13, note 45, notes that the Laurentian MS has a different Incipit from BN 7453, but CU Magdalene 27 and Vienna 5508 agree with the latter Incipit.

[2] Haskins, p. 14.

[3] In the preface to his translation of el-Biruni's commentary on al-Fargani he says, "Lest therefore, completely intent upon the footprints of the ancients, I seem to dissent from the moderns utterly . . .", (*Ne itaque antiquorum vestigiis penitus insistens a modernis prorsus videar dissentire,*—Haskins, p. 8). In the preface to the Pseudo-Aristotle on the 255 books of the Indians he speaks of Bishop Michael as

tinually urging him to write not only what he has gathered from the books of the ancients but what he has learned by experiment.[1] In the preface to his translation of Albumasar's *Book of Rains* he tells Bishop Michael that "what the modern astrologers of the Gauls most bemoan their lack of, your benignity may bestow upon posterity," [2] and the distribution of manuscripts of his translations in European libraries indicates that they were widely influential.

A contemporary memorial of Gerard of Cremona.

The best source for the life and works of Gerard of Cremona [3] (1114-1187) is a memorandum attached by his friends to what was presumably his last work, a translation of the *Tegni* of Galen with the commentary of Haly, in imitation of Galen who in old age was induced to draw up a list of his own works. Gerard, however, is already dead when his associates write, having worked right up to life's close and passed away in 1187 at the age of seventy-three. They state that from the very cradle he was educated in the lap of philosophy, and that he learned all he could in every department of it studied among the Latins. Then, moved by his passion for the Almagest, which he found nowhere among the Latins, he came to Toledo. There, beholding the

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exalted above moderns or contemporaries (*ultra modernos vel coequevos,*—Haskins, 10) in fame and love of learning, and later of "what can be fully explained by none of the moderns" (*quod a nullo modernorum plenissime valet explicari*—Haskins, p. 11). In the preface to Albumasar's *Book of Rains* occurs the allusion to modern astrologers of the Gauls given below in the text.

[1] Haskins, p. 10.

[2] *Ibid.,* p. 12, ". . . tue offero dignitati, ut quod potissimum sibi deesse moderni deflent astrologi gallorum posteritati tua benignitas largiatur."

[3] Baldassare Boncompagni, *Della Vita e delle Opere di Gherardo Cremonese traduttore del secolo duodecimo e di Gherardo da Sabbionetta Astronomo del secolo decimoterzo, Roma,* 1851.

Giovanni Brambilla, *Monografie di due illustri Cremonesi, Gherardo Toletano e Gherardo Patulo, Cremona,* 1894. It largely repeats Boncompagni without acknowledgement.

K. Sudhoff, *Die kurze Vita und das Verzeichnis der Arbeiten Gerhards von Cremona, von seinen Schülern und Studiengenossen kurz nach dem Tode des Meisters* (1187) *zu Toledo verabfasst,* in *Archiv f. Gesch. d. Medizin, herausg v. d. Puschmann-Stiftung an der Universität Leipzig,* VIII, 73, Nov., 1914.

V. Rose, in *Hermes,* VIII (1874), 334.

A. A. Björnbo, *Alkindi, Tideus und Pseudo-Euclid,* 1911 (*Abhandl. z. Gesch. d. Math. Wiss.* XXVI, 3), 127, 137, 150, etc.

Steinschneider (1905), 16-32.

abundance of books in every field in Arabic and the poverty of the Latins in this respect, he devoted his life to the labor of translation, scorning the desires of the flesh, although he was rich in worldly goods, and adhering to things of the spirit alone. He toiled for the advantage of all both present and future, not unmindful of the injunction of Ptolemy to work good increasingly as you near your end. Now, that his name may not be hidden in silence and darkness, and that no alien name may be inscribed by presumptuous thievery in his translations, the more so since he (like Galen) never signed his own name to any of them, they have drawn up a list of all the works translated by him whether in dialectic or geometry, in "astrology" or philosophy, in medicine or in the other sciences.[1]

Account by a pupil of his astrological teaching.

Another contemporary picture of Gerard's activity at Toledo is provided us by the Englishman, Daniel of Morley, or *de Merlai,* who went to Spain to study the sciences of the *quadrivium.* He tells how Gerard of Toledo (*Gerardus tholetanus*), interpreting the Almagest in Latin with the aid of Galippus, the Mozarab,[2] asserted that various future events followed necessarily from the movements and influences of the stars. Daniel was at first astounded by this utterance and brought forward the arguments against the *mathematici* or astrologers in the homily of St. Gregory. But Gerard answered them all glibly. It should perhaps be added that in another passage Daniel without mentioning Gerard speaks of setting down in Latin what he learned concerning the universe in the speech of Toledo from Galippus, the Mozarab.[1] Gerard's translation of the Almagest seems to have been completed in 1175,[2] but meanwhile in Sicily an anonymous translation from the Greek had appeared, probably soon after 1160. Of it we shall presently have something to say. Gerard's version was, however, the generally accepted one, as the number of manuscripts and citations of it show.

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[1] Boncompagni (1851), 3-4, from Vatican 2392, fols. 97v-98r. I have, except for changing the order, practically translated the Latin text of the *Vita,* which with some omissions is as follows: ". . . Ne igitur magister gerardus cremonensis sub taciturnitatis tenebris lateat . . . ne per presumptuosam rapinam libris ab ipso translatis titulus infigatur alienus presertim cum nulli eorum nomen suum iscripsisset, cuncta opera ab eodem translata tam de dyalectica quam de geometria, tam de astrologia quam de phylosophya, tam etiam de physica quam de aliis scientiis, in fine huius tegni novissime ab eo translati, imitando Galenum de commemoratione suorum librorum in fine eiusdem per socios ipsius diligentissime fuerint connumerata. . . . Is etiam cum bonis floreret temporalibus. . . . Carnis desideriis inimicando solis spiritualibus adhaerebat. Cunctis etiam presentibus atque futuris prodesse laborabat non immemor illius ptolomei, cum fini appropinquas, bonum cum augmento operare. Et cum ab istis infantie cunabulis in gremiis philosophiae educatus esset, et ad cuiuslibet partis ipsius notitiam secundum latinorum studium pervenisset, amore tamen almagesti quem apud latinos minime reperiit tolectum perexit. Ubi librorum cuiuslibet facultatis habundantiam in arabico cernens et latinorum penurie de ipsis quam noverit miserans . . ." etc.

Other less complete lists of Gerard's works are found in the following MSS: Laon 413; All Souls 68, fol. 109; Ashmole 357, fol. 57.

[2] Arundel 377, 13th century, fols. 88-103, Philosophia magistri danielis de merlai ad iohannem Norwicensem episcopum, fol. 103r, "qui galippo mixtarabe interpretante almagesti latinavit."

Character of Gerard's translations.

But to return to the list of Gerard's translations. Only three of the long list are strictly dialectical, Aristotle's *Posterior Analytics,* the commentary of Themistius upon them, and Alfarabi on the syllogism. And only one or two of the translations listed under the heading *De phylosophya* are pure philosophy.[3] Most of Gerard's work is mathematical and medical, natural and occult science. He translates Ptolemy and Euclid; Archimedes, Galen and Aristotle; Autolycus and Theodosius; and such writers in Arabic as Alkindi, Alfarabi, Albucasis, Alfraganus, Messahala, Thebit, Geber, Alhazen, Isaac, Rasis, and Avicenna. His mathematical translations include the fields of algebra and perspective as well as geometry and astronomy. Of Aristotle's natural philosophy the list includes the *Physics, De coelo et mundo, De generatione et corruptione, De meteoris* except the fourth and last book which he could not find,[4] and the first part of the astrological *De causis proprietatum et elementorum* ascribed to Aristotle. Among his translations of Galen was the apocryphal *De secretis,* of which we shall have more to say in a later chapter on books of experiments. Three treatises of alchemy are included in the list of his translations and also a geomancy, although Boncompagni tries to saddle the latter upon Gerardus de Sabloneto. Gerard is also supposed to have translated some works not mentioned in this list but ascribed to him in the manuscripts. One of interest to us is a work on stones of the Pseudo-Aristotle.[1]

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[1] Arundel 377, fol. 89v, "quod a galippo mixtarabe in lingua tholetana didici latine subscribitur."

[2] Boncompagni (1851) 18, quoting Laurent. Plut. 89, 13th century.

[3] Such as "Aristotelis de expositione bonitatis pure."

[4] It was translated from the Greek about the middle of the twelfth century by Aristippus, minister of William the Bad of Sicily: see Singer (1917) p. 24; V. Rose, *Die Lücke im Diogenes Laertius und der alte Uebersetzer,* in *Hermes* I (1866) 376; Haskins (1920) p. 605; F. H. Fobes, *Medieval Versions of Aristotle's*

Science and religion in the preface to a translation of the *Almagest* from the Greek.

We must say a word of the anonymous Sicilian translation of the *Almagest* which preceded that of Gerard of Cremona, because of a defense in its preface [2] of natural science against a theological opposition of which the anonymous translator appears to be painfully conscious. After darkly hinting that he was prevented from speedily completing the translation by "other secret" obstacles [3] as well as by the manifest fact that he did not understand "the science of the stars" well,[4] and remarking that the artisan can hope for nothing where the art is in disrepute, the translator inveighs against those who rashly judge things about which they know nothing, and who, lest they seem ignorant themselves, call what they do not know useless and profane. Hence the Arabs say that there is no greater enemy of an art than one who is unacquainted with it. So far the tone of the preface reminds one strongly of those of William of Conches. The writer proceeds to complain that the opposition to mathematical studies has gone so far that "the science of numbers and mensuration is thought entirely super-

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Meteorology, in *Classical Philology* X (1915) 297-314; Greek text, ed. Fobes, Cambridge, 1919.

[1] Ed. V. Rose, in *Zeitschrift f. deutsches Alterthum,* XVIII (1875) 349-82.

[2] The preface was printed by Haskins and Lockwood, *The Sicilian Translators of the Twelfth Century,* in *Harvard Studies in Classical Philology,* XXI (1910) pp. 99-102, to which text the following citations apply. Commented upon by J. L. Heiberg, *Noch einmal die mittelalterliche Ptolemaios-Uebersetzung,* in *Hermes,* XLVI (1911) 207-16.

[3] Line 31.

[4] Line 42.

fluous and useless, while the study of astronomy (i. e. astrology) is esteemed idolatry." [1] Yet Remigius tells us that Abraham taught the Egyptians "astrology" (i. e. astronomy), and the translator ironically adds that he supposes it can be shown from Moses and Daniel that God condemned the science of the stars. He then dilates on how essential it is to study and understand the created world before rising to study of the Creator, and waxes sarcastic at the expense of those who study theology before they know anything else and think themselves able like eagles to soar aloft at once above the clouds, disdaining earth and earthly things, and to gaze unblinded upon the full sun: [2]—a passage somewhat similar to Roger Bacon's diatribe against the "boy-theologians" in the following century.

Arabs and moderns.

The translator, although his own rendition is from a Greek manuscript, shows some familiarity with Arabic learning. Besides the Arabic saying already quoted, in giving the Greek title of Ptolemy's thirteen books on astronomy he adds that the Saracens call it by the corrupt name, *elmeguisti* (i. e. *Almagest*).[3] He also acknowledges the aid he has received from Eugene, the admiral or emir, whose translation of Ptolemy's *Optics* from the Arabic we have mentioned elsewhere, and whom he describes as equally skilled in Greek and Arabic, and "also not ignorant of Latin." It may also be noted that as Adelard of Bath contrasted "the writings of men of old" with "the science of moderns," [4] so this translator characterizes Ptolemy as *veterum lima, specculum modernorum.*

Astronomy at Marseilles.

This seems the best place to call attention to some evidence for the existence of astronomical, and apparently also astrological, activity at Marseilles in the twelfth century, seemingly under the influence of the Arabic astronomy and astrology. In a manuscript at Paris which the catalogue dates of the twelfth century [5] is a treatise formerly said to have been composed at Marseilles in the year 1111 A. D. But Duhem has suggested that the XI should be XL, since the author tells of a dispute at Marseilles in 1139.[1] The text tells how to find the location of the planets for the city of Marseilles and is accompanied by astronomical tables imitating Azarchel. The same treatise appears in a manuscript at Cambridge,[2] written before the year 1175, where it is entitled "The Book of the Courses of the Seven Planets for Marseilles" and seems to be attributed to a Raymond of that city. Duhem notes that our author often cites an earlier treatise of his, *De compositione astrolabii.* The treatise opens with allusion to "many of the Indians and Chaldeans and Arabs"; the author also says, "And since we were the first of the Latins to whom this science came after the translation of the Arabs," and avers that he employs the Christian calendar and chronology in order to avoid all appearance of heresy or infidelity. So we would seem to be justified in connecting it with the diffusion of Arabic astronomy and astrology. Our author believes that God endowed the sky with the virtue of presaging the future, cites various authorities sacred and profane in favor of astrology, and emphasizes especially the importance of astrological medicine.[3] It was also at Marseilles that William of England early in the next century in the year 1219 wrote his brief but very popular treatise, found in many manuscripts, entitled "Of Urine Unseen" (*De urina non visa*), that is, how by astrology to diagnose a case and tell the color and substance of the urine without seeing it. Of it we shall treat again later in connection with thirteenth century medicine. But we may note here that

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[1] Line 61.

[2] Line 87 *et seq.*

[3] Line 23.

[4] Lines 20-21.

[5] BN 14704, fols. 144-70 (present numbering, fols. 110r-35v). The handwriting seems to me later than the twelfth century, but I am

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not an expert in such matters. The text ends at fol. 118v; the rest is tables.

[1] Duhem, III (1915), 201-16.

[2] CU McClean 165, fols. 44-47, Liber cursuum planetarum vii super Massiliam, "Cum multos indorum seu caldeorum atque arabum. . / . . Attamen siquis providus fuerit premissa satis emendare poterit. Expl. liber cursuum planetarum vii." The Paris MS ends with the same sentence, but prefixes at the beginning, "Ad honorem et laudem dominis nostri, patris scilicet et filii," etc. I have examined the Paris but not the Cambridge MS. Duhem does not note the latter.

[3] Duhem (1915) 205.

William, although of English nationality, was a citizen of Marseilles, and that the person to whom his work *Of Urine Unseen* was addressed had formerly studied with him at Marseilles. William is also spoken of as a professor of medicine. Furthermore in at least one manuscript William of England is called a translator from the Arabic, since he is said to have translated from that tongue into Latin "The very great Secret of Catenus, king of the Persians, concerning the virtue of the eagle."[1] We may also note that it was in reply to inquiries which he had received from Jews of Marseilles that Moses Maimonides in 1194 addressed to them his letter on astrology.[2] Interest in astronomy and astrology thus appears to have prevailed at Marseilles from the first half to the close of the twelfth century.

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[1] Merton College 324, 15th century, but with such early works as that of Marbod, fol. 142, Secretissimum regis Cateni Persarum de virtute aquilae, "Est enim aquila rex omnium avium. . . . / . . . Explicit iste tractatus a magistro Willelmo Anglico de lingua Arabica in Latinum translatus." One wonders if it is a fragment of Kiranides.

[2] See below, pp. 206, 211.

APPENDIX I

SOME MEDIEVAL JOHNS, MENTIONED IN THE MANUSCRIPTS, IN THE FIELDS OF NATURAL AND OCCULT SCIENCE, MATHEMATICS, AND MEDICINE

Johannes Anglicus: see John of Montpellier.

Johannes Archangel: Additional 22773, 13th century, fol. 45, "Tabule Johannis Archangeli" astronomiae; said to be the same as Johannes Campanus.

Johannes de Beltone, Sloane 314, 15th century, fol. 106, Experimentum de re astrologica bonum (imperfect).

Johannes Blanchinus, BN 7268, Distinctiones in Ptolemaei almagestum; BN 7269, 7270, 7271, 7286, Tabulae astronomicae; BN 7270, 7271, de primo mobili; Perugia 1004, 15th century, "Tractatus primus de arithmetricha per Johannem de Blanchinis. . . . Regule conclusionum ad practicam algebre in simplicibus. . . . Tractatus florum Almagesti." Professor Karpinski informs me that the *Flores Almagesti* of Giovanni Bianchini was discussed by L. Birkenmajer in *Bull. d. l'Acad. d. Sciences de Cracovie,* 1911.

Johannes Bonia, Valentinus, BN 7416A, translated Fachy, *Sex genera instrumentorum sive Canones Quadrantis universolis;* see Steinschneider (1905) p. 39.

John of Brescia, who translated with Profatius Judaeus at Montpellier; see Steinschneider (1905) 40.

John of Campania, BN 6948, 14th century, # 1, "Abenzoaris Taysir sive rectificatio medicationis et regiminis," translated from Hebrew into Latin.

Johannes Campanus (of Novara) is of course well known for his *Theory of the Planets* and translation of and commentary on Euclid. Perhaps less familiar works are: Additional 22772, 15th century, Johannis Campani Novarensis liber astronomicus de erroribus Ptolemaei, dedicated to Pope Urban IV; Amplon. Quarto 349, late 14th century, fols. 57-65, de figura sectorum; indeed, the collection of Amplonius at Erfurt is rich in works by Campanus. Concerning him see further HL XXI (1847) 248-54 and Duhem III (1915) 317-21. They hold that Campanus is not called John in the MSS. His letter to Urban IV (1261-1265) and Simon of Genoa's dedication of this *Clavis sanationis* in 1292 to "master Campanus, chaplain of the pope and canon at Paris," serve to date him in the later 13th century.

John of Cilicia (apparently the same as John of Sicily), Harleian 1, fols. 92-151, Scripta super Canones Arzachelis de tabulis Toletanis.

John Dastine (or Dastyn), among whose treatises on alchemy may be mentioned Ashmole 1446, fols. 141-54v, "Incipit epistola . . . ad Papam Johannem XXII transmissa de alchimia"; also found in CU Trinity 1122, 14-15th century, fol. 94v-.

Johannes de Dondis, Laud. Misc. 620, 16th century, "Opus Planetarii Johannis de Dondis, fisici, Paduani civis."

Iohannes Egidii Zamorensis, Berlin 934, 14th century, 242 fols., de historia naturali; it includes a reproduction of John of Spain's 39 chapters on the astrolabe.

John of Florence, Magliabech. XI-22; XVI-66, fols. 260-301, "Incipit liber de magni lapidis compositione editus a magistro artis generalis florentino. . . . / . . . Explicit secretum secretorum mineralis lapidis mag Io."

Joannes de Janua (Genoa), BN 7281, 7322, Canon eclypsium; 7281, Investigatio eclipseos solis 1337; 7282, Canones Tabulares. He is classed by Duhem IV (1916) 74-, as a disciple of Jean des Linières.

Joannes de Lineriis, BN 7281, 15th century, #9, Theorica planetarum ed. anno 1335, #11, Canones tabularum Alphonsi anno 1310; and other astronomical treatises in BN 7282, 7285, 7295, 7295A, 7329, 7378A, 7405, etc. Gonville and Caius 110, 14th century, pp. 1-6, Canones super magnum almanach omnium planetarum a mag. Iohanne de Lineriis picardi ambianensis dyocesis, compositum super meridianum parisiensem. See also Duhem IV (1916) 60-68, "Jean des Linières."

Ioannes Lodoycus Tetrapharmacus, S. Marco XIV-38, 14th century, 160 fols., "Antidotarius Galaf Albucassim Açarauni a Ioanne Lodoyco Tetrapharmaco gebenensi filio Petri fructiferi mathematici . . . de arabico in latinum translatus" (1198 A. D.).

John of London, BN 7413, 14th century, fols. 19v-21r, de astrologia judicaria ad R. de Guedingue, or it may be better described as a letter, written in 1246 or shortly thereafter ("usque ad consideracionem meam que fuit anno Christi 1246"), in which John discusses various matters, including the motion of the eighth sphere and dog days, and states that he is sending a transcript of tables of the fixed stars which he verified at Paris.

The John of London who gave so many MSS to the library of St. Augustine's, Canterbury—see James (1903)—would seem to have been of later date, since his books included works of Aquinas, Roger Bacon, and John Peckham, the chronicle of Martin which extends to 1277, translations of the astrological treatises of Abraham aben Ezra which were not made until toward the close of the 13th century, and even treatises by Joannes de Lineriis who wrote in the early 14th century and William of St. Cloud who made his astronomical observations between 1285 and 1321. It therefore seems unlikely that the donor, John of London, could be even the young lad who was spoken of in such high terms by Roger Bacon, as is suggested by James (1903) pp. lxxiv-vii. Possibly the Friar John mentioned below is Bacon's protégé.

John Manduith, CUL 1572 (Gg. VI. 3), 14th century, astronomical treatises and tables. Other MSS, mentioned by Tanner (1748) p. 506, contain tables finished by him in Oxford in 1310.

Johannis de Mehun (Jean de Meun), de lapide minerali et de lapide vegetabili, Sloane 976, 15th century, fols. 85-108; Sloane 1069, 16th century.

Johannes de Messina, a translator for Alfonso X in 1276; perhaps identical with John of Sicily, see Steinschneider (1905) p. 51.

Fratris Joannis ord. Minorum Summa de astrologia, BN 7293A, 14th century, #3. Possibly this is Roger Bacon's lad John following in his master's footsteps.

John of Montpellier or Anglicus (and see John of St. Giles), a treatise on the quadrant. BN 7298, 7414, 7416B, 7437, Joannes de Montepessulano de quadrante; Firenze II-iii-22, 16th century, fols. 268-82, "Explicit quadrans magistri Iohannis Anglici in monte;" Firenze II-iii-24, 14th century, fols. 176-82, "Incipit tractatus quadrantis veteris secundum magistrum Iohannem de Montepessulano." CUL 1707 (Qi. I. 15), fols. 10-14r, "Quadrans Magistri Johannis Anglici in Monte Pessulano." CUL 1767 (Qi, III. 3), 1276 A. D., fols. 56-60, Tractatus quadrantis editus a magistro Johanne in monte Pessulano.

John of Meurs (Johannes de Muris), a French writer on music, mathematics and astronomy in 1321, 1322, 1323, 1339, and 1345. Parts of his works have been printed. See further L. C. Karpinski, "The 'Quadripartitum numerorum' of John of Meurs," in *Bibl. Math.* (1912-1913) 99-114; R. Hirschfeld, *Io. de Muris*, 1884; Duhem (1916) IV, 30-37.

Johannes Ocreatus, see Steinschneider (1905) p. 51.

Johannes Papiensis, see Steinschneider (1905) p. 51.

Johannes Parisiensis, master in theology, besides several theological treatises wrote *de yride* and *super librum metheorum.* His *Contra corruptum Thome* shows that he wrote after Aquinas. See Denifle (1886) p. 226.

There was also a medical writer named John of Paris who perhaps, rather than Thaddeus of Florence, wrote the treatise, De complexionibus corporis humani, Amplon. Quarto 35, 1421 A. D., fols. 142-58. The remark of V. Rose may also be recalled, "Ioh. Parisiensis ist bekanntlich ein Mädchen für alles."

John of Poland, Addit. 22668, 13th-14th century, Liber Magistri Johannis Poloni," medical recipes, etc.

Johannes de Probavilla, Vienna 2520, 14th century, fols. 37-50, "Liber de signis prognosticis."

John of Procida, see De Renzi, III, 71, Placita Philosophorum Moralium Antiquorum ex Graeco in Latinum translata a Magistro Joanne de Procida Magno cive Salernitano.

Johannes de Protsschida, CLM 27006, 15th century, fols. 216-31, Compendium de occultis naturae.

Ioannes de Rupecissa, a Franciscan who wrote various works on alchemy and who was imprisoned by the pope in 1345 for his prophecies concerning the church and antichrist; it would take too long to list the MSS here.

Johannes de Sacrobosco (John Holywood), well known for his *Sphere,* which has been repeatedly printed and was the subject of commentaries by many medieval authors.

Joannes de S. Aegidio (John of St. Giles, also Anglicus or de Sancto Albano), Bodleian 786, fol. 170, Experimenta (medical).

John of St. Amand, a medical writer, discussed in our 58th chapter.

Johannes de Sancto Paulo, another medical writer whose best known work seems to be that on medicinal simples.

John of Salisbury; see our 41st chapter.

John of Saxony, or John Danko of Saxony, at Paris in 1331 wrote a commentary on the astrological Ysagogicus of Alchabitius, which John of Spain had earlier translated. Amplon. Quarto 354, 14th century, fols. 4-59, Commenta Dankonis scilicet magistri Iohannis de Saxonia super Alkubicium; Amplon. Folio 387, 14th century, 46 fols., Iohannis Danconis Saxonis almanach secundum tabulas Alfonsinas compositum et annis 1336-1380 meridiano Parisiensi accomodatum—also in Amplon. Folio 389 and many other MSS; BN 7197, 7281, 7286, 7295A, Canones ad motum stellarum ordinati. Duhem IV (1916) 77 and 578-81 holds that two men have been confounded as John of Saxony,—one of the 13th, the other of the 14th century.

Johannes de Sicca Villa, Royal 12-E-XXV, fols. 37-65, de principiis naturae.

Joannes de Sicilia, BN 7281, 7406, Expositio super canones Arzachelis. Steinschneider (1905) p. 51, dates it in 1290 and regards this John as "hardly to be identified" ("schwerlich identisch") with John of Messina. See also Duhem IV (1916) 6-9.

Joannes de Toledo, perhaps identical with John of Spain, as we have said.

Iohannes de Tornamira, dean or chancellor of Montpellier, Amplon. Folio 272, 1391 A. D., fols. 1-214, Clarificatorium . . . procedens secundum Rasim in nono Almansoris.

Joannes Vincentius, Presbyter, Prior Eccles. de Monast, super Ledum, BN 3446, 15th century, #2, Adversus magicas artes et eos qui dicunt artibus eisdem nullam inesse efficaciam; Incipit missing.

John of Wallingford, Cotton Julius D-VII, fols. 1-7r, an astronomical fragment.

CHAPTER XXXIX

BERNARD SILVESTER: ASTROLOGY AND GEOMANCY

Problem of his identity—His works—Their influence—Disregard of Christian theology—The divine stars—Orders of spirits—The stars rule nature and reveal the future—Plot of the *Mathematicus*—Different interpretations put upon the *Mathematicus*—Hildebert's Hermaphrodite's horoscope—The art of geomancy—Prologue of the *Experimentarius*—Pictures of Bernard Silvester—Problem of a spying-tube and Hermann's relation to the *Experimentarius*—Text of the *Experimentarius*—Two versions of the 28 Judges—Other modes of divination—Divination of the physician of King Amalricus—*Prenostica Socratis Basilei*—Further modes of divination—Experimental character of geomancy—Various other geomancies—Interest of statesmen and clergy in the art—Appendix I. Manuscripts of the *Experimentarius* of Bernard Silvester.

"Nell' ora che non può il calor diurno
Intrepidar più il freddo della luna,
Vinto da terra, o talor da Saturno
Quando i geomanti lor Maggior Fortuna
Veggiono in oriente, innanzi all' alba,
Surger per via che poco le sta bruno."
Purg. XIX, 1-6.

Problem of his identity.

BERNARD SILVESTER, of whom this chapter will treat, is now generally recognized as a different person from the Bernard of Chartres whom William of Conches followed and on whose teaching John of Salisbury looked back.[1] From John's account it is plain that Bernard of Chartres belonged to the generation before William of Conches, and Clerval has shown reason to believe that he was dead by 1130.[1] Bernard Silvester, on the other hand, wrote his *De mundi universitate* during the pontificate of Eugenius III, 1145-1153. Moreover, one of his pupils informs us that he taught at Tours.[2] This last fact also makes it difficult, although not impossible, to identify him with a Breton, named Bernard de Moelan, who, after serving as canon and chancellor at Chartres, became bishop of Quimper from 1159 to 1167.[3] At least they appear to have had somewhat similar interests, and Silvester seems to have had some connection with the school of Chartres, since he dedicated the *De mundi universitate* to Theodoric of Chartres.[4]

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[1] Clerval, *Les Écoles de Chartres*, Paris, 1895, pp. 158-63. The point was for a time contested by Ch. V. Langlois, "Maître Bernard," in *Bibl. de l'École des Chartes*, LIV (1893) and by Hauréau. The two Bernards are still identified in EB, 11th edition, while Steinschneider (1905), p. 8, still identified Bernard of Chartres with the author of *De mundi universitate*.

His works.

A number of works are extant under the name of Bernard Silvester. His interest in rhetoric and poetry is shown by a long *Summa dictaminis* (or, *dictaminum*) and by a *Liber de metrificatura,* in the *Titulus* of which he is called "a poet of the first rank" (*optimi poetae*).[5] He also wrote a commentary on the first books of the *Aeneid.*[6] Two other treatises are ascribed to him in which we are not here further interested, namely: *De forma vitae honestae* and *De cura rei familiaris* or *Epistola ad Raimundum de modo rei familiaris gubernandae.*[7] The three works of especial interest to us, while no one of them is exactly a treatise on astrology, all illustrate, albeit each in a different way, the dominance of astrological doctrine in the thought of the time. One is *Experimentarius,* an astrological geomancy translated into verse from the Arabic.[8] Another is a narrative poem whose plot hinges upon an astrologer's prediction and whose very title is *Mathematicus*.[1] The third work, variously entitled *De mundi universitate, Megacosmus et Microcosmus,* and *Cosmographia*[2] has much to say of the stars and their rule over inferior creation.[3] It is written partly in prose and partly in verse,[4] and shows that Bernard laid as much stress on literary form in his scientific or pseudo-scientific works as in those on rhetoric and meter. Sandys says of it, "The rhythm of the hexameters is clearly that of Lucan, while the vocabulary is mainly that of Ovid"; but Dr. Poole believes that the hexameters are modelled upon Lucretius.[5] He would date it either in 1145 or about 1147-1148.[6]

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[1] Dr. R. L. Poole, EHR (1920), p. 327, does not regard this as absolutely certain but agrees at p. 331 "that the evidence of place and time make it impossible to identify Bernard Silvester with Bernard of Chartres," as he had done earlier in *Illustrations of Medieval Thought* (1884), pp. 113-26.

[2] B. Hauréau, *Le Mathematicus de Bernard Silvestris,* Paris, 1895, p. 11.

[3] Clerval (1895), pp. 158, 173.

[4] BN 6415, fol. 74v, "Terrico veris scientiarum titulis doctori famosissimo bernardus silvestris opus suum."

[5] Clerval (1895), pp. 173-4.

[6] BN 16246, 15th century. Extracts from it are printed by Cousin, *Fragments philosophiques,* II, 348-52. John of Salisbury in 1159 used it in the *Polycraticus,* ed. Webb (1909) I, xxx, xlii-xliii.

[7] Many MSS at Paris, BN 3195, 5698, 6395, 6477, 6480, 7054, 8299, 8513, and probably others. MSS catalogues often ascribe it to St. Bernard.

[8] Attention was first called to it by Langlois, *Maître Bernard,*

Their influence.

The manuscripts of these three works are fairly numerous, indicating that they were widely read, and no con-

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1893. It has not been printed. A description of some of the MSS of it will be found in Appendix I at the close of this chapter.

[1] B. Hauréau, *Le Mathematicus de Bernard Silvestris,* Paris, 1895, contains the text and lists the following MSS: BN 3718, 5129, 6415; Tours 300; Cambrai 875; Bodleian A-44; Vatican 344, 370, 1440 *de la Reine;* Berlin Cod. Theol. Octavo 94. Printed in Migne PL 171, 1365-80, among the poems of Hildebert of Tours.

[2] Ed. by Wrobel and Barach, in *Bibl. Philos. mediae aetatis,* Innsbruck, 1876, from two MSS, Vienna 526 and CLM 23434. HL XII (1763), p. 261 *et seq.,* had already listed six MSS in the then Royal Library at Paris (now there are at least eight, BN 3245, 6415, 6752A, 7994, 8320, 8751C, 8808A, and 15009, 12-13th century, fol. 187), four at the Vatican, and many others elsewhere. The following may be added:

Cotton Titus D-XX, fols. 110v-115r, Bernardi Sylvestris de utroque mundo, majore et minore.

Cotton Cleopatra A-XIV, fols. 1-26, Bernardi Sylvestris cosmographia proso-metrice in qua de multis rebus physicis agitur.

Additional 35112, Liber de mundi philosophia, author not named.

Sloane 2477 and Royal 15-A-XXXII.

CU Trinity 1335, early 13th century, fols. 1-25v, Bernardi Silvestris Cosmographia.

CU Trinity 1368 (II), late 12th century, 50 leaves, Bernardi Silvestris Megacosmus et Microcosmus.

[3] Clerval's (1895) pp. 259-61, "Le système de Bernard Silvester," is limited to the *De mundi universitate* and says nothing of his obvious astrological doctrine, although at p. 240 Clerval briefly states that in that work Bernard takes over many figures from pagan astrology.

[4] HL XII (1763) p. 261 *et seq.,* besides the *De mundi universitate* mentioned "two poems in elegiacs written expressly in defense of the influence of the constellations." These were very probably the *Mathematicus* and *Experimentarius,* or the two parts or versions of the latter.

[5] *History of Classical Scholarship* (1903) I, 515; *Illustrations of Medieval Thought* (1884) p. 118.

[6] EHR (1920) p. 331.

temporary objection appears to have been raised against their rather extreme astrological doctrines. As was well observed concerning the *De mundi universitate* over one hundred and fifty years ago, "These extravagances and some other similar ones did not prevent the book from achieving a very brilliant success from the moment of its first appearance," as is shown by the contemporary testimony of Peter Cantor in the closing twelfth century and Eberhart de Bethune in the early thirteenth century, who says that the *De mundi universitate* was read in the schools. Gervaise of Tilbury and Vincent of Beauvais also cited it.[1] Indeed in our next chapter we shall find a Christian abbess, saint, and prophetess of Bernard's own time charged—by a modern writer, it is true—with making use of it in her visions. Passages from Silvester are included in a thirteenth century collection of "Proverbs" from ancient and recent writers,[2] and more than one copy of the *De mundi universitate* is listed in such a medieval monastic library as St. Augustine's, Canterbury.[3]

Disregard of Christian theology.

In the *De mundi universitate* we see the same influence of Platonism and astronomy, and of the Latin translation of the *Timaeus* in especial, as in the *Philosophia* of William of Conches. At the same time, its abstract personages and personified sciences, its *Nous* and *Natura,* its *Urania* and *Physis* with her two daughters, *Theoretical and Practical,* remind us of the pages of Martianus Capella and of Adelard of Bath's *De eodem et diverso.* The characterization by Dr. Poole that the work "has an entirely pagan complexion," and that Bernard's scheme of cosmology is pantheistic and takes no account of Christian theology,[4] is essentially true, although occasionally some utterance indicates that the writer is acquainted with Christianity and no true pagan. Perhaps it is just because Bernard makes no pretense of being a theologian, that at a time when William of Conches was retracting in his *Dragmaticon* some of the views expressed in his *Philosophia* and the Sicilian translator was conscious of a bigoted theological opposition, Bernard should display neither fear nor consciousness of the existence of any such opposition. And yet it does not appear that the Sicilian translator engaged in theological discussion. Yet he complains of those who call astronomy idolatry; Bernard calmly calls the stars gods, and no one seems to have raised the least objection. At least Bernard's fearless outspokenness and its subsequent popularity should prevent our laying too much stress upon the timidity of other writers in expressing new views, and should make us hesitate before interpreting their attitude as a sure sign of real danger to freedom of thought and speech, and to scientific investigation.

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[1] HL XII (1763) p. 261 *et seq.*

[2] Berlin 193 (Phillips 1827), fol. 25v, "Proverbia."

[3] Indeed, the 15th century catalogue of that abbey lists one MS, 1482, which contains both the *Megacosmus* and *Mathematicus,* with the treatise of Valerius to Rufinus on not getting married sandwiched in between.

[4] Poole (1884) pp. 117-18.

The divine stars.

What especially concerns our investigation are the views concerning stars and spirits expressed by Silvester. Like William of Conches, he describes the world of spirits in a Platonic or Neo-Platonic, rather than patristic, style. He differs from William in hardly using the word "demon" at all and in according the stars, like Adelard of Bath, a much higher place in his hierarchy. "The heaven itself is full of God," says Bernard, "and the sky has its own animals, sidereal fires," [1] just as man, who is in part a spiritual being, inhabits the earth. Bernard does not hesitate to call the stars "gods who serve God in person," or "who serve in God's very presence." [2] There in the region of purer ether which extends as far as the sun they enjoy the vision of bliss eternal, free from all care and distraction, and resting in the peace of God which passeth all understanding.[3] He also repeats the Platonic doctrine that the mind is from the sky and that the human soul, when at last it lays aside the body, "will return to its kindred stars, added as a god to the number of superior beings."[1]

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[1] *De mundi universitate*, II, 6, 10, "Caelum ipsum Deo plenum est. . . . Sua caelo animalia ignes siderei. . . ."

[2] *Ibid.*, I, 3, 6-7,
"Motus circuitus numina turba deum
Dico deos quorum ante Deum praesentia servit."
Also II, 4, 39, "deos caelumque."

[3] *Ibid.*, II, 6, 49, "Qui quia aeternae beatitudinis visione perfruuntur, ab omni distrahentis curae sollicitudine feriati in pace Dei quae omnem sensum superat conquiescunt."

Orders of spirits.

Between heaven and earth, between God and man, comes the mediate and composite order of "angelic creation." "With the divinity of the stars" the members of this order share the attribute of deathlessness; with man they have this in common, to be stirred by passion and impulse.[2] Between sun and moon are benevolent angels who act as mediums between God and man. Other spirits inhabit the air beneath the moon. Some of them display an affinity to the near-by ether and fire, and live in tranquillity and mental serenity, although dwelling in the air. A second variety are the *genii* who are associated each with some man from birth to warn and guide him. But in the lower atmosphere are disorderly and malignant spirits who often are divinely commissioned to torment evil-doers, or sometimes torment men of their own volition. Often they invisibly invade human minds and thoughts by silent suggestion; again they assume bodies and take on ghostly forms. These Bernard calls *angelos desertores,* or fallen angels. But there are still left to be noted the spirits who inhabit the earth, on mountains or in forests and by streams: *Silvani,* Pans, and *Nerei.* They are of harmless character (*innocua conversatione*) and, being composed of the elements in a pure state, are long-lived but in the process of time will dissolve again.[3] This classification of spirits seems to follow Martianus Capella.

The stars rule nature and reveal the future.

Bernard's assertion that the stars are gods is accompanied, as one would naturally expect, by a belief in their control of nature and revelation of the future. From their proximity to God they receive from His mind the secrets of the future, which they "establish through the lower species of the universe by inevitable necessity."[1] Life comes to the world of nature from the sky as if from God, and the creatures of the earth, air, and water could not move from their tracks, did they not absorb vivifying motions from the sky.[2] *Nous* or Intelligence says to Nature, "I would have you behold the sky, inscribed with a multiform variety of images, which, like a book with open pages, containing the future in cryptic letters, I have revealed to the eyes of the more learned."[3] In another passage Bernard affirms that God writes in the stars of the sky what can come "from fatal law," that the movements of the stars control all ages, that there already is latent in the stars a series of events which long time will unfold, and that all the events of history, even the birth of Christ, have been foreshadowed by the stars.

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[1] *De mundi universitate,* II, 4, 49-50.

"Corpore iam posito cognata
 reibit ad astra
Additus in numero superum
 deus."

[2] *Ibid.,* II, 6, 36-, "Participat enim angelicae creationis numerus cum siderum divinitate quod non moritur; cum homine, quod passionum affectibus incitatur."

[3] *Ibid.,* II, 6, 92 *et seq.*

"Scribit enim caelum stellis totumque figurat
Quod de fatali lege venire potest,
Praesignat qualique modo qualique tenore
Omnia sidereus saecula motus agat.
Praejacet in stellis series quam longior aetas
Explicet et spatiis temporis ordo suis:
Sceptra Phoronei, fratrum discordia Thebae,
Flammae Phaëthonis, Deucalionis aquae.
In stellis Codri paupertas, copia Croesi,
Incestus Paridis, Hippolytique pudor;
In stellis Priami species, audacia Turni,
Sensus Ulixeus, Herculeusque vigor.
In stellis pugil est Pollux, et navita Typhis,
Et Cicero rhetor, et geometra Thales;
In stellis lepidus dictat Maro, Milo figurat,
Fulgurat in latia nobilitate Nero.
Astra notat Persis, Aegyptus parturit artes,
Graecia docta legit, praelia Roma gerit.
Exemplar specimenque Dei virguncula Christum
Parturit, et verum saecula numen habent."[4]

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[1] *De mundi universitate,* II, 6, 47-.

[2] *Ibid.,* I, 4, 5-.

[3] *Ibid.,* II, 1, 23-.

[4] *Ibid.,* I, 3, 33 *et seq.*

Yet Bernard urges man to model his life after the stars,[1] and once speaks of "what is free in the will and what is of necessity." He thus appears, like the author of the treatise on fate ascribed to Plutarch, like Boethius, and like a host of other theologians, philosophers, and astrologers, to believe in the co-existence of free will, inevitable fate, and "variable fortune." [2]

Plot of the *Mathematicus.*

Bernard Silvester's interest and faith in the art of astrology is further exemplified by his poem *Mathematicus,* a narrative which throughout assumes the truth of astrological prediction concerning human fortune. Hauréau showed that it had been incorrectly included among the works of Hildebert of Tours and Le Mans, and that the theme is suggested in the fourth Pseudo-Quintillian declamation, but that Bernard has added largely to the plot there briefly outlined. A Roman knight and lady were in every respect well endowed both by nature and fortune except that their marriage had up to the moment when the story opens been a childless one. At last the wife consulted an astrologer or *mathematicus,* "who could learn from the stars," we are told, "the intentions of the gods, the mind of the fates, and the plan of Jove, and discover the hidden causes and secrets of nature." He informed her that she would bear a son who would become a great genius and the ruler of Rome, but who would one day kill his father. When the wife told her husband of this prediction, he made her promise to kill the child in infancy. But when the time came, her mother love prevailed and she secretly sent the boy away to be reared, while she assured her husband that he was dead. She named her son *Patricida* in order that he might abhor the crime of patricide the more. The boy early gave signs of great intellectual capacity. Among other studies he learned "the orbits of the stars and how human fate is under the stars," and he "clasped divine Aristotle to his breast." Later on, when Rome was hard pressed by the Carthaginians and her king was in captivity, he rallied her defeated forces and ended the war in triumph.

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[1] *De mundi universitate,* II, 4, 31-50; and II, 1, 30-32.

[2] *Ibid.,* II, 1, 33-35.

"Parcarum leges et ineluctabile fatum
Fortunaeque vices variabilis
Quae sit in arbitrio res libera quidve necesse."

> "And because the fatal order demands it so shall be,
> The fates gave him this path to dominion. . . .
> Blind chance sways the silly toiling of men;
> Our world is the plaything and sport of the gods."

The king thereupon abdicated in favor of *Patricida,* whom he addressed in these words, "O youth, on whose birth, if there is any power in the stars, a favorable horoscope looked down."

The mother rejoiced to hear of her son's success, and marveled at the correctness of the astrologer's prediction, but was now the more troubled as to her husband's fate. He noticed her distraction and at last induced her to tell him its cause. But then, instead of being angry at the deception which she had practiced upon him, and instead of being alarmed at the prospect of his own death, he, too, rejoiced in his son's success, and said that he would die happy, if he could but see and embrace him. He accordingly made himself known to his son and told him how he had once ordered his death but had been thwarted by the eternal predestined order of events, and how some day his son would slay him, not of evil intent but compelled by the courses of the stars. "And manifest is the fault of the gods in that you cannot be kinder to your father."

The son thereupon determines that he will evade the decree of the stars by committing suicide. He is represented as soliloquizing as follows:

> "How is our mind akin to the ethereal stars,
> If it suffers the sad necessity of harsh Lachesis?
> In vain we possess a particle of the divine mind,
> If our reason cannot make provision for itself.

> God so made the elements, so made the fiery stars,
> That man is not subject to the stars."

Patricida accordingly summons all the Romans together, and, after inducing them by an eloquent rehearsal of his great services in their behalf to grant him any boon that he may ask, says that his wish is to die; and at this point the poem ends, leaving us uninformed whether the last part of the astrologer's prediction remained unfulfilled, or whether Patricida's suicide caused his father's death, or whether possibly some solution was found in a play upon the word *Patricida.* Hauréau, however, believed that the poem is complete as it stands.

Different interpretations put upon the *Mathematicus.*

The purpose of the poet and his attitude towards astrology have been interpreted in diametrically opposite ways by different scholars. Before Hauréau it was customary to attribute the poem to Hildebert, archbishop of Tours, and to regard it as an attack upon astrology. The early editors of the *Histoire Littéraire de la France* supported their assertion that the most judicious men of letters in the eleventh and twelfth centuries had only a sovereign scorn for the widely current astrological superstition of their time by citing Hildebert as ridiculing the art in his *Mathematicus.*[1] A century later Charles Jourdain again represented Hildebert as turning to ridicule the vain speculations of the astrologers.[2] Bourassé, the editor of Hildebert's works as they appear in Migne's *Patrologia Latina,* seems to have felt that the poem was scarcely an outspoken attack upon astrology and tried to explain it as an academic exercise which was not to be taken seriously, but regarded as satire upon judicial astrology. Hauréau not only denied Archbishop Hildebert's authorship, but took the common sense view that the poet believes fully in astrology. It would, indeed, be difficult to detect any suggestion of ridicule or satire about the poem. Its plot is a tragic one and it seems written in all seriousness. Even Patricida, despite his assertion that "man is not subject to the stars," does not doubt that he will kill his father conformably to the learned astrologer's prediction, if he himself continues to live. It is only by the *tour de force* of self-slaughter that he hopes to cheat fate.

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[1] HL VII (1746) p. 137.

[2] C. Jourdain, *Dissertation sur l'état de la philosophie naturelle etc.,* Paris, 1838, p. 116, note.

Hildebert's Hermaphrodite's horoscope.

Even Archbishop Hildebert shows a tendency towards astrology in other poems attributed to him; for example, in his *Nativity of Christ* and in a short poem, *The Hermaphrodite,* which reads as follows, representing the fulfillment of a horoscope:

> "While my pregnant mother bore me in the womb, 'tis said the gods deliberated what she should bring forth. Phoebus said, 'It is a boy'; Mars, 'A girl'; Juno, 'Neither.' So when I was born, I was a hermaphrodite. When I seek to die, the goddess says, 'He shall be slain by a weapon'; Mars, 'By crucifixion'; Phoebus, 'By drowning.' So it turned out. A tree shades the water; I climb it; the sword I carry by chance slips from its scabbard; I myself fall upon it; my trunk is impaled in the branches; my head falls into the river. Thus I, man, woman, and neither, suffered flood, sword, and cross." [1]

This poem has always been greatly admired by students of Latin literature for its epigrammatic neatness and conciseness, and has been thought too good to be the work of a medieval writer, and has been even attributed to Petronius. Another version, by the medieval poet, Peter Riga, entitled *De ortu et morte pueri monstruosi,* is longer and far less elegant. Hauréau, however, regarded *the Hermaphrodite* as a medieval composition, since there are no manuscripts of it earlier than the twelfth century; but he was in doubt whether to ascribe it to Hildebert or to Matthew of Vendôme, who in listing his own poems mentions *hic et haec hermaphroditus homo.*[2]

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[1] Migne, PL 171, 1446. Juno here stands for the planet Venus: see Hyginus II, 42, "Stella Veneris, Lucifer nomine, quam nonnulli Junonis esse dixerunt"; and other passages cited by Bouché-Leclercq, *L'Astrologie grecque,* 1899, p. 99, note 2.

[2] J. B. Hauréau, *Les mélanges poétiques d'Hildebert,* 1882, pp.

The art of geomancy.

We turn to the association of the name of Bernard Silvester with the superstitious art of geomancy. It may be briefly defined as a method of divination in which, by marking down a number of points at random and then connecting or cancelling them by lines, a number or figure is obtained which is used as a key to sets of tables or to astrological constellations. The only reason for calling this geomancy, that is, divination by means of the element earth, would seem to be that at first the marks were made and figures drawn in the sand or dust, like those of Archimedes during the siege of Syracuse. But by the middle ages, at least, any kind of writing material would do as well. Although a somewhat more abstruse form of superstition than the ouija board, it seems to have been nearly as popular in the medieval period as the ouija board is now.

Prologue of the *Experimentarius.*

The name of Bernard Silvester is persistently associated in the manuscripts with a work bearing the title *Experimentarius,* which seems to consist of sets of geomantic tables translated from the Arabic. Its prologue is unmistakable, but it is less easy to make out what text should go with it and how the text should be arranged. Sometimes the prologue is found alone in the manuscripts,[1] and the text which accompanies it in others varies in amount and sometimes is more or less mixed up with other similar modes of divination. The prologue is sometimes headed, *Evidencia operis subsequentis,* and regularly subdivides into three brief sections. The first, opening with the words, *Materia huius libelli,* describes the subject-matter of the text as "the effect and efficacy of the moon and other planets and of the constellations, which they exert upon inferior things." The writer's opinion is that God permits mortals who make sane and sober inquiry to learn by subtle consideration of the

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138-47. In Digby 53, a poetical miscellany of the end of the 12th century, no author is named for the "De Ermaphrodito" nor for some other items which appear in the printed edition of Hildebert's poems, although Hildebert's name is attached to a few pieces in the MS.

[1] Ashmole 345, late 14th century, fol. 64. Bodleian Auct. F. 3. 13, fol. 104v. For a summary of the MSS see Appendix I at the close of this chapter.

constellations many things concerning the future and persons who are absent, and that astrology also gives information concerning human character, health and sickness, prosperity, fertility of the soil, the state of sea and air, business matters and journeys. In a second paragraph, opening, *Utilitas autem huius libelli*, the writer states that the use of his book is that one may avoid the perils of which the stars give warning by penitence and prayers and vows to God who, as the astrologer Albumasar admits, controls the stars. And through them the Creator reveals his will, as in the case of the three Magi who learned from a star that a great prophet had been born. Finally, in a paragraph of a single sentence, which opens with the words, *Titulus vero talis est,* we are informed that the title is the *Experimentarius* of Bernard Silvester, "not because he was the original author but the faithful translator from Arabic into Latin."

Pictures of Bernard Silvester.

In one manuscript which contains the *Experimentarius* there is twice depicted, although the second time in different colors, a seated human figure evidently intended to represent Bernard Silvester. He is bearded and sits in a chair writing, with a pen in one hand and a knife or scalpel in the other. Neither miniature is in juxtaposition to the prologue in which Bernard is named, but in both cases the figure is accompanied by five lines of text, written alternately in red and blue colors and proclaiming that Bernard Silvester is the translator and that the number seven is the basis in this infallible book of lot-casting.[1] It would not be safe, however, to accept this miniature as an accurate representation of Bernard, since the manuscript is not contemporary and it contains similar portraits of Socrates and Plato, Pythagoras, Anaxagoras, and Cicero.

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[1] Digby 46, 14th century, fol. 1v, the first line is blue, the next red, etc.

An sors instabilis melius ferat ars docet eius
In septem stabis minus una petens numerabis
Post septem sursum numerando perfice cursum
Translator Bernardus Silvester
Hic infallibilis liber incipit autem peius.

At fol. 25v, the same five lines except that the last line is put first, where it would seem to belong, and is accordingly colored red instead of blue as before, the colors of the other four lines remaining the same as before.

Problem of a spying-tube and Hermann's relation to the *Experimentarius.*

Both in the manuscript which we have just been describing and another of older date [1] is a picture of two persons seated. In both manuscripts one is called Euclid, in the older manuscript only is the other named, and designated as Hermann. According to Black's description Euclid "uplifts a sphere with his right hand, and with his left holds a telescope through which he is observing the stars; towards whom 'Hermannus,' on the other side, holds forth a circular instrument hanging from his fingers, which is superscribed 'Astrolabium.'" The picture in the other manuscript is similar, but in view of the fact that they were written in the thirteenth and fourteenth centuries, the rod along which, or tube through which 'Euclid' is squinting, can scarcely be regarded as a telescope without more definite proof of the invention of that instrument before the time of Galileo. Perhaps it is a *dioptra* [2] or spying-tube of the sort described by the ancients, Polybius and Hero, and used in surveying. But I mention the picture for the further reason that Clerval [3] asserted a connection between Hermann of Dalmatia, the twelfth century translator, and Bernard Silvester, affirming that Hermann sent Bernard his work on the uses of the astrolabe and that he really translated the *Experimentarius* from the Arabic and sent it to Bernard who merely versified it. But we have already proved that it was Hermann the Lame of the eleventh century who wrote on the astrolabe and that he did so a century before Bernard Silvester. The aforesaid picture is clearly of him and not of Hermann the Dalmatian. And whether the "B" at whose request Hermann wrote on the astrolabe be meant for Berengarius or Bernard, it certainly cannot be meant for Bernard Silvester, who was not born yet.

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[1] Ashmole 304, 13th century, fol. 2v.

[2] In this connection the following MS might prove of interest: CU Trinity 1352, 17th century, neatly written, *Dioptrica Practica.* Fol. 1 is missing and with it the full title. Cap 1, *de Telescopiorum ac Microscopium Inventione, diversitate, et varietati. Quaestio I, Quid sunt Telescopia et quomodo ac quando inventa.* After fol. 90 is a single leaf of diagrams.

[3] Clerval (1895), pp. 169, 190-91.

Text of the *Experimentarius.*

Apparently the text proper of the *Experimentarius* opens with the usual instructions of geomancies for the chance casting of points and drawing of lines. The number of points left over as a result of this procedure is used as a guide in finding the answer to the question which one has in mind. In a preliminary table are listed 28 subjects of inquiry such as life and death, marriage, imprisonment, enemies, gain. One turns to the topic in which one is interested and, according as the number of points obtained by chance is over or under seven, reckons forward or backward that many times from the number opposite his theme of inquiry, or, if exactly seven points were left over, takes the number of the theme of inquiry as he finds it. In one manuscript the new number thus obtained is that of the "Judge of the Fates" to whom one should next turn. There are 28 such judges, whose names are the Arabic designations for the 28 divisions of the circle of the zodiac or mansions of the moon, which spends a day in each of them.[1] A page is devoted to each judge, under whose name are twenty-eight lines containing as many responses to the twenty-eight subjects of inquiry. The inquirer selects a line corresponding to his number of points and the tables are so arranged that he thus always receives the answer which fits his inquiry. But most of the manuscripts, instead of at once referring the inquirer to his Judge as we have described, insert other preliminary tables in which he is first referred to a planet and then to a day of the moon. This unnecessarily indirect and complicated system is probably intended to mystify the reader and to emphasize further the supposedly astrological basis of the

[1] These 28 Judges, or mansions of the moon, are seldom spelled twice alike in the MSS, but are somewhat as follows: *Almazene, Anatha, Albathon, Arthura, Adoran, Almusan, Atha, Arian, Anathia, Althare, Albuza, Alcoreten, Arpha, Alana, Asionet, Algaphar, Azavenu, Alakyal, Alcalu, Aleum, Avaadh, Avelde, Cathateue, Eadabula, Eadatauht, Eadalana, Algafalmar, Algagafalui.*

procedure, whereas it is in reality purely a matter of lot-casting.

Two versions of the 28 judges.

Now in most of the manuscripts which I have examined there are two versions of these twenty-eight pages of Judges of the Fates, worded differently, although the corresponding lines always seem to answer the same questions and apply to the same topics of inquiry as before. In the version which comes first, for example, the first line under the first Judge, *Almazene* or the belly of Aries, is

Tuum indumentum durabit tempore longo

while in the second version the same line reads,

Hoc ornamentum decus est et fama ferentum.[1]

Both versions seem to be regarded as the *Experimentarius* of Bernard Silvester, for in the manuscripts where they occur together the first usually follows its prologue, while the second is preceded by his picture and the line, *Translator Bernardus Silvester.*[2] In one manuscript[3] the prologue is immediately followed by the second version and the first set of Judges does not occur. In some manuscripts,[4] however, the second version occurs without the first and without the prologue, in which cases, I think, there is nothing to indicate that it is by Bernard Silvester or a part of the *Experimentarius.* The first version ends in several manuscripts with the words, *Explicit libellus de constellationibus*[5] rather than some such phrase as *Explicit Experimentarius.* Furthermore in some manuscripts where it occurs alone this first set of Judges is called the book of Alchandiandus or Alkardianus.[1] He may, however, have been the Arabic author and Bernard his translator, and the *liber alkardiani phylosophi* opens in at least one manuscript with words appropriate to the title, *Experimentarius,* "Since everything that is tested by experience is experienced either for its own sake or on some other account." [2]

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[1] In the MSS, which are very carelessly and often slovenly written, the wording of these lines varies a good deal, for instance, in Digby 46, fol. 11r, "Sum (*sic*) monumentum durabit tempore longo," and in CU Trinity 1404 (II), fol. 2r, "Hoc ornamentum est et fama parentum."

[2] Digby 46, fol. 25v; in Ashmole 304 the corresponding leaf has been cut out, probably for the sake of the miniature; Sloane 3857, fol. 181v, omits the picture but has the phrase, "Translator Bernardus Silvester."

[3] Sloane 3554, fol. 13v-.

[4] Ashmole 342, early 14th century, # 2.

Ashmole 399, late 13th century, fols. 54-8.

Royal 12-C-XII, fols. 108-23.

CU Trinity 1404 (II), 14-15th century, fols. 2-16.

Some of these MSS I have not seen.

[5] Digby 46, fol. 24v; Ashmole 304, fol. 16v; Sloane 3857, fol. 180v.

Other modes of divination.

There are so many treatises of this type in medieval manuscripts and they are so frequently collected in one *codex* that they are liable to be confused with one another. Thus in two manuscripts a method of divination ascribed to the physician of King Amalricus [3] is in such juxtaposition to the *Experimentarius* that Macray takes it to be part of the *Experimentarius,* while the catalogue of the Sloane Manuscripts combines the two as "a compilation 'concerning the art of Ptolemy.'" Macray also includes in the *Experimentarius* a *Praenostica Socratis Basilci,* which is of frequent occurrence in the manuscripts, and other treatises on divination which are either anonymous or ascribed to Pythagoras and, judging from the miniatures prefixed to them, to Anaxagoras and Cicero, who thus again is appropriately punished for having written a work against divination. I doubt if these other modes of divination are parts of the *Experimentarius,* which often is found without them, as are some of them without it. But they are so much like it in general form and procedure that we may consider them now, especially as they are of such dubious date and authorship that it would be difficult to place them more exactly.

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[1] Additional 15236, English hand of 13-14th century, fols. 130-52r, "libellus Alchandiandi"; BN 7486, 14th century, fol. 30v, "Incipit liber alkardiani phylosophi. Cum omne quod experitur sit experiendum propter se vel propter aliud. . . ." And see above, the latter pages of Chapter 30.

[2] See the preceding note.

[3] Sloane 3554, fol. 1-; Digby 46, fols. 3r-5v, and fol. 90r. But in both MSS it precedes the prologue of the *Experimentarius.* Macray was probably induced to regard everything in Digby 46 up to fol. 92r as *Experimentarius* by the picture of Bernard Silvester which occurs at fol. 1v with the accompanying five lines stating that he is the translator of "this infallible book." But the picture is probably misplaced, since it occurs again at fol. 25v before the second version of the 28 Judges.

Divination of the physician of King Amalricus.

The treatise which is assigned to the physician of King Amalricus and which is said to have been composed in memory of that monarch's great victory over the Saracens and Turks in Egypt, obtains its key number by revolution of a wheel [1] rather than by the geomantic casting of points, and introduces a trifle more of astrological observance. If on first applying the inquirer receives an unfavorable reply, he may wait for thirty days and try again, but after the third failure he must desist entirely. "It is not allowed to inquire concerning one thing more than three times." The twenty-eight subjects of inquiry are divided in groups of four among the seven planets, and the inquirer is told to return on the weekday named after the planet under which his query falls. On the day set the astrologer must further determine with the astrolabe when the hour of the same planet has arrived, and not until then may the divination by means of the wheel take place, as a result of which the inquirer is directed as before to one of 28 Judges who in this case, however, are said to be associated with mansions of the sun [2] rather than moon. At the close of the treatise of the physician of King Amalricus in both manuscripts [3] that I have examined is inserted some sceptical person's opinion to the effect that these methods of divination are subtle trifles which are not utterly useless as a means of diversion, but that faith should not be placed in them. The more apparent the devil's nets are, concludes the passage, the more wary the human bird will be.

Prenostica Socratis Basilei.

In the *Prenostica* or *Prenosticon Socratis Basilei*—Prognostic of Socrates the King—a number from one to nine is obtained by chance either by geomancy or by revolving a wheel on which an image of "King Socrates" points his finger. The inquirer then consults a table where sixteen questions are so arranged in compartments designated by letters of the alphabet that each question is found in two compartments. Say that the inquirer finds his question in A and E. He then consults another table where 144 names of birds, beasts, fish, stones, herbs, flowers, cities, and other "species" are arranged in nine rows opposite the numbers from one to nine and in sixteen columns headed by the sixteen possible pairs of letters such as the AE of our inquirer. Looking in the row corresponding to his number and the column AE he obtains a name. He must then find this name in a series of twelve circular tables where the aforesaid names are listed under their proper species, each table containing twelve names. He now is referred on to one of sixteen kings of the Turks, India, Spain, Francia, Babylonia, the Saracens, Romania, etc. Under each king nine answers are listed and here at last under his original number obtained by lot he finds the appropriate answer.[1]

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[1] Inset inside the thick cover of Digby 46 are two interlocking wooden cogwheels for this purpose, with 28 and 13 teeth respectively.

[2] In Digby 46 diagrams showing the number of stars in each are given.

[3] Digby 46, fol. 5v; Sloane 3554, fol. 12r.

Further modes of divination.

In the *Prenostica Pitagorice* we are assured that we may rest easy as to the integrity of the Catholic Faith being observed, "for that does not happen of necessity which human caution forewarned, can avoid." It answers any one of a list of thirty-six questions by means of a number obtained by chance between one and twelve. The inquirer is referred to one of 36 birds whose pictures are drawn in the margins with twelve lines of answers opposite each bird. Other schemes of divination found with the *Experimentarius* in some manuscripts differ from the foregoing only in the number of questions concerning which inquiry can be made, the number of Judges and the names given them, the number of lines under each Judge, and the number of intermediate directory tables that have to be consulted before the final Judge is reached. As Judges we meet the twelve sons of Jacob, the thirty-six decans or thirds of the twelve signs, and another astrological group of twenty made up of the twelve signs, seven planets, and the dragon.[1]

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[1] I have described the *Prenostica* as it is found in Digby 46, fol. 40r-, with a picture at fol. 41v of Socrates seated and Plato standing behind him and pointing. Ashmole 304 has the same text and picture; and the text is practically the same in Sloane 3857, fols. 196-207, "*Documentum subsequentis considerationis quae Socratica dicitur.*" In Additional 15236, 13-14th century, fols. 95r-108r, the inquirer is first directed to implore divine aid and repeat a Paternoster and Ave Maria, and some details are slightly different, but the general method is identical. The final answers are given in French. In BN 7420A, 14th century, fol. 126r- (or clxxxvi, or col. 451), "*Liber magni solacii socratis philosophi*" is also essentially the same; indeed, its opening words are, "*Pronosticis Socratis basilii.*" Preceding it are similar methods of divination, beginning at fol. 121v (or clxxxii or col. 440), "*Si vis operare de geomancia debes facere quatuor lineas. . . .*" Evidently the following is also our treatise: CU Trinity 1404 (IV), 14-15th century, *Iste liber dicitur Rota fortune in qua sunt 16 questiones determinate in pronosticis sententiat'.* (sic) *basilici que sub sequentibus inscribuntur et sunt 12 spere et 16 Reges pro iudicibus constituti et habent determinare veritatem de questionibus antedictis cum auxilio sortium.* James (III, 423) adds, "The questions, tables, spheres, and Kings follow. . . ." Our treatise is also listed in John Whytefeld's 1389 catalogue of MSS in Dover Priory, No. 409, fol. 192v, *Pronostica socratis phi.*

Experimental character of geomancy.

In one manuscript [2] the directions for consulting this last group of Judges are given under the heading, *Documentum experimenti retrogradi,* which like Bernard's *Experimentarius* suggests the experimental character of the art of geomancy or the arts of divination in general. Later we shall hear Albertus Magnus in the *Speculum astronomiae* call treatises of aerimancy,[3] pyromancy ,and hydromancy, as well as of geomancy "experimental books."

Various other geomancies.

Geomancies are of frequent occurrence in libraries of medieval manuscripts.[4] Many are anonymous [5] but others bear the names of noted men of learning. The art must have had great currency among the Arabs,[6] for not only are treatises current in Latin under such names as Abdallah,[1] Albedatus,[2] Alcherius,[3] Alkindi,[4] and Alpharinus,[5] but almost every prominent translator of the time seems to have tried his hand at a geomancy. In the manuscripts we find geomancies attributed to Gerard of Cremona,[6] Plato of Tivoli,[7] Michael Scot,[8] Hugo Sanctelliensis,[9] William of

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[1] These tracts of divination are found in Digby 46, fols. 52r-92r, and partially in Ashmole 304, Sloane 3857, and Sloane 2472.

[2] Sloane 2472, fol. 22r.

[3] The word seems to be regularly so spelled in the middle ages, although modern dictionaries give only aeromancy.

[4] For instance, at Munich the following MSS are devoted to works of geomancy: CLM 192, 196, 240, 242, 276, 392, 398, 421, 436, 456, 458, 483, 489, 541, 547, 588, 671, 677, 905, 11998, 24940, 26061, 26062.

[5] For instance, Amplon. Quarto 174, 14th century, fol. 120, *Geomancia parva;* Qu. 345, 14th century, fols. 47-50, *geomancia cum theorica sua;* Qu. 361, 14th century, fols. 62-79, five treatises; Qu. 365, fol. 83; Qu. 368, 14th century, fol. 30; Qu. 374, 14th century, fols. 1-60; Qu. 377, 14th century, fols. 70-76; Amplon. Octavo 88, 14th century, fols. 5-10; Amplon. Duodecimo 17, 14th century, fols. 27-35. Harleian 671; 4166, 15th century; Royal 12-C-XVI, 15th century; Sloane 887, 16th century, fols. 3-59; 1437, 16th century; 2186, 17th century; 3281, 13-14th century, fols. 25-34, *"Liber 28 iudicum"* or *"Liber parcarum sive fatorum."*

[6] Additional 9600 is a geomancy in Arabic, and Addit. 8790, *La Geomantia del S. Christoforo Cattaneo, Genonese, l'inventore di detta Almadel Arabico.*

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[1] Vatic. Urbin. Lat. 262, 14-15th century, *Abdallah geomantiae fragmenta*. Amplon. Folio 389, 14th century, fols. 56-99, *Geomantia Abdalla astrologi cum figuris;* perhaps the same as Math. 47, *Geomancia cum egregiis tabulis Abdana astrologi,* in the 1412 catalogue.

Amplon. Quarto 380, early 14th century, fols. 1-47, *geomancia optima Abdallah filii Ali.*

Magliabech. XX-13, 15th century, fols. 208-10, *"Il libro di Zaccheria ebrio il quale compuose le tavole de giudici. Disse il famiglio di Abdalla. . . ."*

[2] Amplon, Octavo 88, early 14th century, fols. 1-5, *geomancia Albedato attributa,* fols. 107-10, *Albedatii de sortilegiis.*

CLM 398, 14th century, fols. 106-14, *"Belio regi Persarum vates Albedatus salutem."*

BN 7486, 14th century, fol. 46r-, *Albedaci philosophi ars punctorum;* here the work is addressed to *"Delyo regi Persarum"* and is said to be translated by "Euclid, king and philosopher." It immediately follows another geomancy by Alkardianus, of whom we have spoken elsewhere.

Berlin 965, 16th century, fol. 64-, *"Incipit liber Albedachi vatis Arabici de sortilegiis ad Delium regem Persarum / Finis adest libri Algabri Arabis de sortilegiis";* similarly Amplonius in 1412 listed Math, 8, *"liber subtilis valde Algabre geomanticus ad futurorum negociaciones."*

[3] Vienna 550, 14-15th century, fols. 200-201v, *"Ego Alcherius inter multa prodigia / nudus postea quolibet subhumetur."* Is this the Alcherius mentioned by Mrs. Merrifield (1849) I, 54-6 as copying in 1409 "Experiments with Color," from a MS which he had borrowed?

[4] CLM 489, 16th century, fols. 207-22, *Alchindi libellus de geomantia;* also in CLM 392, 15th century.

[5] Arundel 66, 15th century, fols. 269-77, *"Liber sciencie arienalis de judicis geomansie ab Alpharino filio Abrahe Judeo editus et a Platone de Hebreico sermone in Latinum translatus."*

CLM 11998, anno 1741, fol. 209-, *Alfakini Arabici filii quaestiones geomantiae a Platone in Latinum translatae anno 1535* (which cannot be right).

CU Magdalene College 27 (F. 4. 27, Haenel 23) late 14th century, fols. 120-125v, *"Incipit liber arenalis sciencie ab alfarino abizarch editus et a Platone Tiburtino de Arabico in latinum translatus."*

[6] Bologna University Library 449, 14th century, *"Geomantia ex Arabico translata per Magistrum Gerardum de Cremona. Si quis partem geomanticam / multum bonum signi."*

Magliabech XX-13, fol. 61.

Digby 74, 15-16th century, fols. 1-52.

Sloane 310, 15th century.

Amplon. Quarto 373, 14th century, fols. 1-31, with notes at 32-37.

CLM 276, 14th century, fols. 69-75, *Geomantia mag. Gerardi Cremonensis ab auctoribus via astronomice conposita.*

Also printed under the title *Geomantia astronomica* in H. C. Agrippa, *Opera,* 1600, pp. 540-53.

[7] See note 5.

[8] CLM 489, 16th century, fol. 174-, *Michaelis Scoti geomantia.*

[9] MSS of Hugo's geomancy have already been listed in chapter 38, p. 86.

Moerbeke,[1] William de Saliceto of Piacenza,[2] and Peter of Abano,[3] and even to their medical confrère and contemporary, Bernard Gordon, who is not usually classed as a translator.[4] Some of these, however, were translators from the Greek or the Hebrew rather than Arabic, and some of the geomantic treatises in the manuscripts claim an origin from India.[5] But a Robert or Roger Scriptor who compiled a geomancy towards the close of the medieval period thinks first among his sources of "the Arabs of antiquity and the wise moderns, William of Moerbeke, Bartholomew of Parma, Gerard of Cremona, and many others." [6] These other geomancies are not necessarily like the *Experimentarius* of Bernard Silvester [7] and we shall describe another sort when we come to speak of Bartholomew of Parma in a later chapter.

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[1] CLM 588, 14th century, fols. 6-58, *"Incipit geomantia a fratre gilberto (?) de morbeca domini pape penitentionario compilata quam magistro arnulfo nepoti suo commendavit."*

CLM 905, 15th century, fols. 1-64, *Wilhelmi de Morbeca Geomantia.*

Wolfenbüttel 2725, 14th century, *"Geomantia fratris Guilhelmi de Marbeta penitenciarii domini pape dedicata Arnulpho nepoti. Anno domini millesimo ducentesimo octuagesimo octavo. Hoc opus est scientie geomancie."*

Vienna 5508, 14-15th century, fol. 1-, *"Liber geomancie editus a fratre Wilhelmo de Morbeta. Omnipotens sempiterne Deus / querenti vel in brevi."*

Amplon. Quarto 373, 14th century, fols. 39-118; Qu. 377, 62-67; Qu. 384.

For MSS in Paris see HL 21; 146.

Magliabech. XX-13, 15th century, fol. 101-, in Italian.

CU Trinity 1447, 14th century, fols. 1-112r, a French translation made by Walter the Breton in 1347. He states that Moerbeke's Latin version was translated from the Greek.

[2] Magliabech, XX-13, 15th century, fol. 210-, *"del detto Çacheria Albiçarich,"* translated from Hebrew into Latin by *"maestro Saliceto."*

[3] CLM 392, 15th century; 489, 16th century, fol. 222, *Petri de Abano Patavini modus iudicandi quaestiones;* in both MSS accompanied by the geomancy ascribed to Alkindi. Printed in Italian translation, 1542.

[4] BN 15353, 13-14th century, fol. 87-, *Archanum magni Dei revelatum Tholomeo regi Arabum de reductione geomancie ad orbem, tr. de Bernard de Gordon, datée de 1295.*

[5] Harleian 2404, English hand, two geomancies (*Indeana*).

Sloane 314, 15th century, fols. 2-64, Latin and French, *"Et est Gremmgi Indyana, que vocatur filia astronomie quam fecit unus sapientum Indie."*

With the opinions of Siger of Brabant in 1277 was condemned a book of geomancy which opened *"Estimaverunt Indi"; Chart. Univ. Paris,* I, 543.

CU Magdalene College 27 (F. 4. 27), late 14th century, fols. 72-88, *"Hec est geomantia Indiana."*

[6] Sloane 3487, 15th century, fols. 2-193, *Geomantia Ro. Scriptoris,* fol. 2r, " . . . *arabes antiquissimi et sapientes moderni Guillelmus de morbeca, Bartholomeus de Parma, Gerardus Cremonensis, et alii plures."*

[7] A geomancy by Ralph of Toulouse, however, preserved in

Interest of statesmen and clergy in the art.

In the fifteenth century such intellectual statesmen as Humphrey, Duke of Gloucester, and Henry VII of England displayed an interest in geomancy, judging from a manuscript *de luxe* of Guido Bonatti's work on astrology which was made for Henry VII and contains a picture of him, and also Plato's translation of the geomancy of Alpharinus and geomantic "tables of Humphrey, duke of Gloucester."[1] The interest of the clergy in this superstitious art is attested not only by the translation of such a person as William of Moerbeke, who was papal penitentiary and later archbishop of Corinth, but by a geomancy which we find in two fifteenth century manuscripts written by Martin, an abbot of Burgos, at the request of another abbot of Paris.[2] Treatises on geomancy continue to be found in the manuscripts as late as the eighteenth century, that of Gerard of Cremona especially.

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a 14th century MS, has, like Bernard's, the four pages of key followed by the twenty-eight pages of "judges of the fates," from *"Almatene"* to *"Algagalauro."* Berlin 969, fol. 282-, *"Divinaciones magistri Radulfi de Tolosa."*

[1] Arundel 66 (see above, p. 119, note 5); the portrait of Henry is at fol. 201, at fols. 277v-87, *"Tabulae Humfridi Ducis Glowcestriae in judiciis artis geomansie."*

[2] Corpus Christi 190, fols. 11-52, *"Explicit liber Geomancie compilatus per magistrum Martinum Hispanum phisicum abbatem de Cernatis in ecclesia Vurgensi quam composuit ad preces nobilis et discreti viri domini Archimbaldi abbatis sancti Asteensis ac canonici Parisiensis."*

Ashmole 360-II, fols. 15-44, Explicit as above except *"Burgensi," "Archibaldi,"* and *"Astern."*

Also by the listing of geomancies in the medieval catalogues of monastic libraries. See James, *Libraries of Canterbury and Dover.*

APPENDIX I

MANUSCRIPTS OF THE EXPERIMENTARIUS OF BERNARD SILVESTER

Digby 46, 14th century, fols. 7v-39v.
Ashmole 304, 13th century, fols. 2r-30v.
Sloane 3857, 17th century, fols. 164-95.

These three MSS are much alike both in the *Experimentarius* proper and the other tracts of divination which accompany it. Digby 46 has more of them than either of the others and more pictures than Ashmole 304. Sloane 3857 has no pictures. I have given the numbers of the folios only for the *Experimentarius* proper.

Sloane 2472, a quarto in skin containing 30 leaves, dated in the old written catalogue as late 12th, but in Scott's printed *Index* as 14th century, fols. 3r-14v, the prologue and 22 of 28 Judges of the first version; fols. 15r-21v, the last part of the method of divination by the 36 decans, "Thoas Iudex X" to "Sorab Iudex XXXVI"; fols. 23r-30v, divination by planets and signs as in Digby 46.

Sloane 3554, 15th century, contains the divination of the physician of King Amalricus, the prologue of the *Experimentarius,* and the second set only of 28 Judges.

The following MSS also contain only this second version:

Ashmole 342, early 14th century, #2.
Ashmole 399, late 13th century, fols. 54-8.
CU Trinity 1404 (II), 14-15th century, fols. 2-16.
Royal 12-C-XII, fols. 108-23, has the second version of the *Experimentarius* but also a few of the other items of divination found in Ashmole 304.

The first set of 28 Judges is found without mention of Bernard Silvester in the following MSS:

BN 7486, 14th century, fol. 30v-, "Incipit liber alkardiani phylosophi. Cum omne quod experitur sit experiendum propter se vel propter aliud."

Additional 15236, 13-14th century, English hand, fols. 130-52r, "libellus Alchandiandi"; and at fols. 95r-108r, Prenosticon Socratis Basilei.

The prologue of the *Experimentarius* is found alone in

Ashmole 345, late 14th century, fol. 64, "Bernardinus."

Bodleian (Bernard 2177, #6) Auct. F. 3. 13, fol. 104v, "Bernardini silvestris."

CHAPTER XL

SAINT HILDEGARD OF BINGEN: 1098-1179

Was Hildegard influenced by Bernard Silvester?—(Bibliographical note)—Her personality and reputation—Dates of her works—Question of their genuineness—Question of her knowledge of Latin—Subject-matter of her works—Relations between science and religion in them—Her peculiar views concerning winds and rivers—Her suggestions concerning drinking-water—The devil as the negative principle—Natural substances and evil spirits—Stars and fallen angels; sin and nature—Nature in Adam's time; the antediluvian period—Spiritual lessons from natural phenomena—Hildegard's attitude toward magic—Magic Art's defense—True Worship's reply—Magic properties of natural substances—Instances of counter-magic—Ceremony with a jacinth and wheaten loaf—Her superstitious procedure—Use of herbs—Marvelous virtues of gems—Remarkable properties of fish—Use of the parts of birds—Cures from quadrupeds—The unicorn, weasel, and mouse—What animals to eat and wear—Insects and reptiles—Animal compounds—Magic and astrology closely connected—Astrology and divination condemned—Signs in the stars—Superiors and inferiors; effect of stars and winds on elements and humors—Influence of the moon on human health and generation—Relation of the four humors to human character and fate—Hildegard's varying position—Nativities for the days of the moon—Man the microcosm—Divination in dreams.

Was Hildegard influenced by Bernard Silvester?

THE discussion of macrocosm and microcosm, *nous* and *hyle*, by Bernard Silvester in the *De mundi universitate* is believed by Dr. Charles Singer, in a recent essay on "The Scientific Views and Visions of Saint Hildegard," to have influenced her later writings, such as the *Liber vitae meritorum* and the *Liber divinorum operum*. He writes "The work of Bernard . . . corresponds so closely both in form, in spirit, and sometimes even in phraseology to the *Liber divinorum operum* that it appears to us certain that Hildegard must have had access to it." [1] Without subscribing unreservedly to this view, we pass on from the Platonist and geomancer of Tours to the Christian "sibyl of the Rhine."[1]

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[1] Singer (1917) p. 19.

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[1] Migne, *Patrologia Latina*, vol. 197. This volume contains the account of Hildegard in the *Acta Sanctorum*, including the *Vita sanctae Hildegardis auctoribus Godefrido et Theodorico monachis*, etc.; the *Subtilitatum diversarum naturarum creaturarum libri novem*, as edited by Daremberg and Reuss; the *Scivias* and the *Liber divinorum operum simplicis hominis*. I shall cite this in the following chapter simply as *Migne* without repeating the number of the volume.

Pitra, *Analecta sacra*, vol. VIII (1882). This volume contains the only printed edition of the *Liber vitae meritorum*, pp. 1-244, —Heinemann, in describing a thirteenth century copy of it (MS 1053, S. Hildegardis liber meritorum vite) in 1886 in his Catalogue of Wolfenbüttel MSS, was therefore mistaken in speaking of it as "unprinted,"—an imperfect edition of the *Liber compositae medicinae de aegritudinum causis signis atque curis*, and other works by Hildegard.

A better edition of the last named work is: *Hildegardis causae et curae*, ed. Paulus Kaiser, Leipzig, Teubner, 1903.

Earlier editions of the *Subtilitates* were printed at Strasburg by J. Schott in 1533 and 1544 as follows:

Physica S. Hildegardis elementorum fluminum aliquot Germaniae metallorum leguminum fructuum et herbarum arborum et arbustorum piscium denique volatilium et animantium terrae naturas et operationes IV libris mirabili experientia posteritati tradens, Argentorati, 1533.

Experimentarius medicinae continens Trotulae curandarum aegritudinum muliebrum . . . item quatuor Hildegardis de elementorum fluminum aliquot Germaniae metallorum . . . herbarum piscium et animantium terrae naturis et operationibus, ed. G. Kraut, 1544.

F. A. Reuss, *De libris physicis S. Hildegardis commentatio historico-medica*, Würzburg, 1835.

F. A. Reuss, *Der heiligen Hildegard Subtilitatum diversarum naturarum creaturarum libri novem, die werthvolleste Urkunde deutscher Natur- und Heilkunde aus dem Mittelalter.* In *Annalen des Vereins für Nassau. Alterthumskunde und Geschichtsforschung*, Bd. VI, Heft i, Wiesbaden, 1859.

Jessen, C. in *Sitzb. Vienna, Math. naturw. Klasse*, (1862) XLV, i. 97.

Jessen, C. *Botanik in kulturhistorischer Entwickelung*, Leipzig, 1862, pp. 124-26.

Jessen, C. in *Anzeiger für Kunde der deutschen Vorzeit*, (1875), p. 175.

Von der Linde, *Die Handschriften der Kgl. Landesbibl. in Wiesbaden*, Wiesbaden, 1877.

Schmelzeis, J. Ph. *Das Leben und Wirken der hl. Hildegardes*, Freiburg, 1879.

Battandier, A. "Sainte Hildegarde, sa vie et ses œuvres," in *Revue des questions historiques*, XXXIII (1883), 395-425.

Roth, F. W. E. in *Zeitsch. für kirchl. Wissenschaft u. kirchl. Leben*, Leipzig, IX (1888), 453.

Kaiser, P. *Die Naturwissenschaftliche Schriften der hl. Hildegard*, Berlin, 1901. (*Schulprogramm des Königsstädtischen Gymnasiums in Berlin.*) A pamphlet of 24 pages. See also his edition, mentioned above, of the *Causae et curae*.

Singer, Chas. "The Scientific Views and Visions of Saint Hildegard," in *Studies in the History and Method of Science*, Oxford, 1917, pp. 1-55. Dr. Singer seems unacquainted with the above work by Kaiser, writing (p. 2) "The extensive literature that has risen around the life and works of Hildegard has come from the hands of writers who have shown no interest in natural knowledge." Yet see also

Her personality and reputation.

From repeated statements in the prefaces to Hildegard's works, in which she tells exactly when she wrote them and how old she was at the time,—for not only was she not reticent on this point but her different statements of her age at different times are all consistent with one another—it is evident that she was born in 1098. Her birthplace was near Sponheim. From the age of five, she tells us in the *Scivias,* she had been subject to visions which did not come to her in her sleep but in her wakeful hours, yet were not seen or heard with the eyes and ears of sense. During her lifetime she was also subject to frequent illness, and very likely there was some connection between her state of health and her susceptibility to visions. She spent her life from her eighth year in religious houses along the Nahe river, and in 1147 became head of a nunnery at its mouth opposite Bingen, the place with which her name was henceforth connected. She became famed for her cures of diseases as well as her visions and ascetic life, and it is Kaiser's opinion that her medical skill contributed more to her popular reputation for saintliness than all her writings. At any rate she became very well known, and her prayers and predictions were much sought after. Thomas Becket, who seems to have been rather too inclined to pry into the future, as we shall see later, wrote asking for "the visions and oracles of that sainted and most celebrated Hildegard," and inquiring whether any revelation had been vouchsafed her as to the duration of the existing papal schism. "For in the days of Pope Eugenius she predicted that not until his last days would he have peace and grace in the city."[1] It is very doubtful whether St. Bernard visited her monastery and called the attention of Pope Eugenius III to her visions, but her letters[2] show her in correspondence with St. Bernard and several popes and emperors, with numerous

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Wasmann, E. "Hildegard von Bingen als älteste deutsche Naturforscherin," in *Biologisches Zentralblatt* XXXIII (1913) 278-88. Herwegen in the *Kirchl. Handlexicon* (1908), I, 1970.

[1] Migne, 28, citing Baronius, *Ann.* 1148, from *Epist. S. Thomas,* I, 171.

[2] I have noted one MS of them in the British Museum, Harleian 1725.

archbishops and bishops, abbots and other potentates, to whom she did not hesitate to administer reproofs and warnings. For this purpose and to aid in the repression of heresy she also made tours from Bingen to various parts of Germany. There is some disagreement whether she died in 1179 or 1180.[1] Proceedings were instituted by the pope in 1233 to investigate her claims to sainthood, but she seems never to have been formally canonized. Gebenon, a Cistercian prior in Eberbach, made a compendium from her *Scivias, Liber divinorum operum,* and *Letters,* "because few can own or read her works." [2]

Dates of Hildegard's works.

As was stated above, we can date some of Hildegard's works with exactness. In her preface to the one entitled *Scivias* [3] she says that in the year 1141, when she was forty-two years and seven months old, a voice from heaven bade her commit her visions to writing. She adds that she scarcely finished the book in ten years, so we infer that she was working at it from 1141 to 1150. This fits exactly with what she tells us in the preface to the *Liber vitae meritorum,* which she was divinely instructed to write in 1158, when she was sixty years old. Moreover, she says that the eight years preceding, that is from 1151 to 1158, had been spent in writing other treatises which also appear to have been revealed in visions and among which were *"subtilitates diversarum naturarum creaturarum,"* the title of another of her works with which we shall be concerned. On the *Liber vitae meritorum* she spent five years, so it should have been completed by 1163. In that year, the preface to the *Liber divinorum operum* informs us,—and the sixty-fifth year of her life—a voice instructed her to begin its composition, and seven more years were required to complete it. This leaves undated only one of the five works by her which we shall consider, namely, the *Causae et curae*, or *Liber compositae medicinae* as it is sometimes called, while the *Subtilitates diversarum naturarum creaturarum* bears a corresponding alternative title, *Liber simplicis medicinae*.

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[1] Migne, 84-85, 129-130.

[2] CLM 2619, 13th century, Gebenonis prioris Cisterc. in Eberbach, Speculum futurorum temporum sive Compendium prophetiarum S. Hildegardis; also, at Rome, Bibl. Alex. 172, 14th century, fols. 1-29.

[3] Early MSS of the *Liber Scivias simplicis hominis* are Palat Lat. 311, 12th century, 204 fols.; Merton 160, early 13th century.

Question of their genuineness.

"Some would impugn the genuineness of all her writings," says the article on Hildegard in *The Catholic Encyclopedia*, "but without sufficient reason."[1] Kaiser, who edited the *Causae et curae*, had no doubt that both it and the *Subtilitates* were genuine works. Recently Singer has excluded them both from his discussion of Hildegard's scientific views on the ground that they are probably spurious, but his arguments are unconvincing. His objection that they are full of German expressions which are absent in her other works is of little consequence, since it would be natural to employ vernacular proper names for homely herbs and local fish and birds and common ailments, while in works of an astronomical and theological character like her other visions there would be little reason for departing from the Latin. Anyway Hildegard's own assertion in the preface of the *Liber vitae meritorum* is decisive that she wrote that work. The almost contemporary biography of her also states that she wrote "certain things concerning the nature of man and the elements, and of diverse creatures,"[2] which may be a blanket reference to the *Causae et curae* as well as the *Subtilitates diversarum naturarum creaturarum*. The records which we have of the proceedings instituted by the pope in 1233 to investigate Hildegard's title to sainthood mention both the *Liber simplicis medicinae* and *Liber compositae medicinae* as her works; and later in the same century Matthew of Westminster ascribed both treatises to her, stating further that the *Liber simplicis medicinae secundum creationem* was in eight books and giving the full title of the other as *Liber compositae medicinae de aegritudinum causis signis et curis.*[1] Kaiser has pointed out a number of parallel passages in it and the *Subtilitates,* while its introductory cosmology seems to me very similar to that of Hildegard's other three works. Indeed, as we consider the contents of these five works together, it will become evident that the same peculiar views and personality run through them all.

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[1] Citing Preyer, *Gesch. d. deutsch. Mystik.* 1874; Hauck, *Kirchengesch, Deutsch.* IV, 398; Von Winterfeld, *Neue Archiv*, XXVII, 297.

[2] Migne, 101, *quaedam de natura hominis et elementorum, diversarumque creaturarum.* Singer, taking the words as an exact title of one work, tries to deny that they apply even to the *Subtilitates;* but the writer of the *Vita* is obviously simply giving a general idea of the subjects treated by Hildegard.

Question of Hildegard's knowledge of Latin.

In the preface to the *Liber vitae meritorum* Hildegard speaks of a man and a girl who gave her some assistance in writing out her visions.[2] From such passages in her own works and from statements of her biographers and other writers[3] it has been inferred that she was untrained in Latin grammar and required literary assistance.[4] Or sometimes it is said that she miraculously became able to speak and write Latin without having ever been instructed in that language.[5] Certainly the *Causae et curae* is a lucid, condensed, and straightforward presentation which it would be very difficult to summarize or excerpt. One must read it all, for further condensation is impossible. One can hardly say as much for her other works, but a new critical edition of them such as the *Causae et curae* has enjoyed might result in an improvement of the style. But our concern is rather with their subject-matter.

Three of the five works which we shall consider are written out in the form of visions, and are primarily re-

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[1] In what is so far the only known extant copy, a thirteenth century MS at Copenhagen, which Jessen discovered in 1859 and called attention to in 1862 (*Act. Acad. Vindob.,* XLV, i. 97-116), the Titulus is *Causae et curae* (shown in facsimile by Singer (1917), Plate 5a.)

[2] Pitra, 7-8, "Et ego testimonio hominis illius quem ut in prioribus visionibus praefata sum occulte quaesieram et inveneram et testimonio cuiusdam puellae mihi assistentis manus ad ascribendum posui."

[3] Vincent of Beauvais, *Speculum historiale,* XXVII, 83, and other actors cited from the *Acta Sanctorum* in Migne, col. 197.

[4] This may be a further explanation of the use of German words in some of her works and their absence in others.

[5] Migne, 17, 19-20, 73-74, 93, 101.

Subject-matter of Hildegard's works.

ligious in their contents but contain considerable cosmology and some human anatomy, as well as some allusions to magic and astrology. The other two deal primarily with medicine and natural science, and give no internal indication of having been revealed in visions, presenting their material in somewhat didactic manner, and being divided into books and chapters, like other medieval treatises on the same subjects. As printed in Migne, the *Subtleties of Different Natural Creatures* or *Book of Medicinal Simples* is in nine books dealing respectively with plants, elements, trees, stones, fish, birds, animals, reptiles, and metals. In this arrangement there is no plan evident [1] and it would seem more logical to have the books on plants and trees and stones and metals together. In Schott's edition of 1533 the discussion of stones was omitted—perhaps properly, since Matthew of Westminster spoke of but eight books—and the remaining topics were grouped in four books instead of eight as in Migne. First came the elements, then metals, then a third book treating of plants and trees, and a fourth book including all sorts of animals.[2] That the *Subtleties* was a widely read and influential work is indicated by the number of manuscripts of it listed by Schmelzeis and Kaiser. Of the five books of the *Causae et curae* the first, beginning with the creation of the universe, Hyle, the creation of the angels, fall of Lucifer, and so forth, deals chiefly with celestial phenomena and the waters of the sea and firmament. The second combines some discussion of Adam and Eve and the deluge with an account of the four elements and humors, human anatomy, and various other natural phenomena.[3] With book three the listing of cures begins and German words appear occasionally in the text.

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[1] It is, however, the order in at least one of the MSS, Wolfenbüttel 3591, 14th century, fols. 1-174, except that the second book is called Of rivers instead of, Of elements: *"B. Hildegardis Physica seu liber subtilitatum de diversis creaturis, scilicet f. 2 de herbis, f. 62 de fluminibus, f. 67 de arboribus, f. 90 de lapidibus preciosis, f. 106v de piscibus, f. 120 de volatilibus, f. 141 de animalibus, f. 162 de vermibus, f. 168 de metallis."*

[2] It was, however, subdivided into three parts, treating respectively of fish, fowl, and other animals.

[3] The variety and confusing order of its contents may be best and briefly indicated by a list of chapter heads (pp. 33-52): *De*

Relations between science and religion in them.

So much attention to the Biblical story of creation and of Adam and Eve as is shown in the first two books of the *Causae et curae* might give one the impression that Hildegard's natural science is highly colored by and entirely subordinated to a religious point of view. But this is not quite the impression that one should take away. A notable thing about even her religious visions is the essential conformity of their cosmology and physiology to the then prevalent theories of natural science. The theory of four elements, the hypothesis of concentric spheres surrounding the earth, the current notions concerning veins and humors, are introduced with slight variations in visions supposed to be of divine origin. In matters of detail Hildegard may make mistakes, or at least differ from the then more generally accepted view, and she displays no little originality in giving a new turn to some of the familiar concepts, as in her five powers of fire, four of air, fifteen of water, and seven of earth.[1] But she does not evolve any really new principles of nature. Possibly it is the spiritual application of these scientific verities that is regarded as the pith of the revelation, but Hildegard certainly says that she sees the natural facts in her visions. The hypotheses of past and contemporary natural science, somewhat obscured or distorted by the figurative and mystical mode of description proper to visions, are embodied in a saint's reveries and

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Adae casu, de spermate, de conceptu, quare homo hirsutus est, de reptilibus, de volatilibus, de piscibus, de conceptus diversitate, de infirmitatibus, de continentia, de incontinentia, de flegmaticis, de melancholis, de melancholice morbo, de elementorum commixtione, de rore, de pruina, de nebula, quod quatuor sunt elementa tantum, de anima et spiritibus, de Adae creatione, de capillis, de interioribus hominis, de auribus, de oculis et naribus, quod in homine sunt elementa, de sanguine, de carne, de generatione, de Adae vivificatione, de Adae prophetia, de animae infusione, de Adae somno, de Evae malitia, de exilio Adae, quare Eva prius cecidit, de diluvio, quare filii Dei, de lapidum gignitione, de iri, de terrae situ, quod homo constat de elementis, de flegmate diversitate, de humoribus, de frenesi, de contractis, de stultis, de paralysi.

[1] *Causae et curae,* pp. 20 and 30.

utilized in inspired revelation. Science serves religion, it is true, but religion for its part does not hesitate to accept science.

Peculiar views concerning winds and rivers.

We cannot take the time to note all of Hildegard's minor variations from the natural science of her time, but may note one or two characteristic points in which her views concerning the universe and nature seem rather daring and unusual, not to say crude and erroneous. In the *Scivias* she represents a blast and lesser winds as emanating from each of four concentric heavens which she depicts as surrounding the earth, namely, a sphere of fire, a shadowy sphere like a skin, a heaven of pure ether, and a region of watery air under it.[1] In the *Liber divinorum operum* she speaks of winds which drive the firmament from east to west and the planets from west to east.[2] In the *Subtilitates* Hildegard seems to entertain the strange notion that rivers are sent forth from the sea like the blood in the veins of the human body.[3] One gets the impression that the rivers flow up-hill toward their sources, since one reads that "the Rhine is sent forth by the force of the sea"[4] and that "some rivers go forth from the sea impetuously, others slowly according to the winds."

Since Hildegard lived on the Nahe or Rhine all her life she must indeed have been absorbed in her visions and monastic life not to have learned in which direction a river flows; and perhaps we should supply the explanation, which she certainly does not expressly give in the *Subtilitates,* that the sea feeds the rivers by evaporation or through subterranean passages. Perhaps a passage in the *Causae et curae* may be taken as a correction or explanation of the preceding assertions, in which case that work would seem to be of later date than the *Subtilitates.* In it too Hildegard states that "springs and rivers" which "flow from the sea" are better in the east than in the west, but her next sentence straightway adds that they are salt and leave a salt deposit on the sands where they flow which is medicinal.[1] The waters rising from the southern sea are also spoken of by her as salt.[2] Even in the *Causae et curae* she speaks of the water of the great sea which surrounds the world as forming a sort of flank to the waters above the firmament.[3]

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[1] Migne, 403-4.

[2] Migne, 791-95.

[3] *Subtilitates,* II, 3 (Migne, 1212), *Mare flumina emittit quibus terra irrigatur velut sanguine venarum corpus hominis.*

[4] *Subtilitates,* II, 5 (Migne), *Rhenus a mari impetu emittitur.* Singer (p. 14) is so non-plussed by this that he actually interprets *mari* as the lake of Constance, and asks, questioning Hildegard's authorship of the *Subtilitates,* "How could she possibly derive all rivers, Rhine and Danube, Meuse and Moselle, Nahe and Glan, from the same lake, as does the author of the *Liber subtilitatum?*"

That all waters, fresh or salt, came originally from the sea is asserted in the *Secretum Secretorum* of the Pseudo-Aristotle, as edited by Roger Bacon: Steele (1920), p. 90.

Suggestions concerning drinking-water.

On the subject of whether waters are wholesome to drink or not Hildegard comes a trifle nearer the truth and somewhat reminds us of the discussions of the same subject in Pliny and Vitruvius.[4] She says that swamp water should always be boiled,[5] that well water is better to drink than spring-water and spring-water than river water, which should be boiled and allowed to cool before drinking;[6] that rain-water is inferior to spring-water[7] and that drinking snow-water is dangerous to the health.[8] The salt waters of the west she regards as too turbid, while the fresh waters of the west are not warmed sufficiently by the sun and should be boiled and allowed to cool before using.[9] The salt waters arising from the south sea are venomous from the presence in them of worms and small animals. Southern fresh waters have been purged by the heat, but make the flesh of men fatty and of black color.[1] Hildegard is not the first author to advise the boiling of drinking-water,[2] but she certainly lays great stress on this point.

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[1] *Causae et curae* (1903), p. 24.

[2] *Ibid.*, p. 25.

[3] *Ibid.*, p. 23.

[4] See Vitruvius, Book VIII, chapters 2-4, on "Rain-water," "Various Properties of Different Waters," and "Tests of Good Water." Pliny, NH, Book XXXI, chapters 21-23, on "The Wholesomeness of Waters", "The Impurities of Water," "Modes of Testing Water."

[5] *Causae et curae* (1903), p. 27.

[6] *Ibid.*, p. 28.

[7] Vitruvius held that rain-water was unusually wholesome, but Pliny disputed this notion.

[8] *Causae et curae* (1903), p. 30, "si quis eam bibit, ulcera et scabies in eo saepissime crescunt ac viscera eius livore implentur." Pliny noted the belief that ice-water and snow-water were unhealthy, and both he (XXXVII, 11) and Vitruvius speak of Alpine streams which cause diseases or swellings in the throat.

[9] *Causae et curae* (1903), pp. 24-25.

The devil as the negative principle.

While the scheme of the universe put forward by ancient and medieval science is, as we have seen, on the whole adopted even in Hildegard's most visionary writings, it is equally true that the religious interest is by no means absent from her two works of medicine and natural history. In the first place, the devil is a force in nature which she often mentions. Her opening the *Causae et curae* with a discussion of creation—of course a usual starting-point with the medieval scientist—soon leads her to speak of the fall of Lucifer. She has a rather good theory that Lucifer in his perverse will strove to raise himself to Nothing, and that since what he wished to do was Nothing, he fell into nothingness and could not stand because he could find no foundation under him.[3] But after the devil was unable to create anything out of nothing and fell from heaven, God created the firmament and sun, moon, and stars to show how great He was and to make the devil realize what glory he had lost.[4] Other creatures who willingly join themselves to the devil lose their own characteristics and become nothing.[5] Lucifer himself is not permitted to move from Tartarus or he would upset the elements and celestial bodies, but a throng of demons of varying individual strength plot with him against the universe.[1] But in other passages Hildegard seems to admit freely the influence, if not the complete presence, of the devil in nature. And he has the power of deceiving by assumed appearances, as Adam was seduced by the serpent.

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[1] *Causae et curae* (1903), p. 26.

[2] Both Vitruvius and Pliny mention the practice, and the latter calls it an invention of the emperor Nero. A note, however, in Bostock and Riley's translation of the *Natural History* states that Galen ascribed the practice to Hippocrates and that Aristotle was undoubtedly acquainted with it. When Pliny goes on to say, "Indeed, it is generally admitted that all water is more wholesome when it has been boiled," another translator's note adds, "This is not at all the opinion at the present day," that is, 1856. But apparently the progress of medical and biological science since 1856 has been in this respect a retrogression to Pliny's view.

[3] *Causae et curae* (1903), p. 1. Somewhat similarly Moses Maimonides, the Jewish philosopher, who was born thirty-seven years after Hildegard, held that evil was mere privation and that the personal devil of scripture was an allegorical representation thereof. He also denied the existence of demons, but considered belief in angels as second only in importance to a belief in God. See Finkelscherer (1894) pp. 40-51; Mischna Commentary to Aboda-zara, IV, 7; Lévy (1911) 89-90.

[4] *Causae et curae* (1903), p. 11.

[5] *Ibid.*, p. 5.

Natural substances and evil spirits.

Indeed, the dragon to this day hates mankind and has such a nature and such diabolical arts in itself that sometimes when it emits its fiery breath, the spirits of the air disturb the air.[2] This illustrates a common feature of Hildegard's natural history and pharmacy; namely, the association of natural substances with evil spirits either in friendly or hostile relationships. In the preface to the first book of the *Subtleties* she states that some herbs cannot be endured by demons, while there are others of which the devil is fond and to which he joins himself. In mandragora, for example, "the influence of the devil is more present than in other herbs; consequently man is stimulated by it according to his desires, whether they be good or bad." [3] On the other hand, the holm-oak is hostile to the spirits of the air; one who sleeps under its shade is free from diabolical illusions, and fumigating a house with it drives out the evil spirits.[4] Certain fish, too, have the property of expelling demons, whether one eats them or burns their livers or bones.[5] Finally, stones and metals have their relations to evil spirits. It is advisable for a woman in childbirth to hold the gem jasper in her hand, "in order that malignant spirits of the air may be the less able to harm her and her child; for the tongue of the ancient serpent extends itself towards the perspiration of the child, as it emerges from the mother's womb." [6] Not only does the touch of red-hot steel weaken the force of poison in food or drink, but that metal also signifies the divinity of God, and the devil flees from and avoids it.[7]

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[1] *Causae et curae*, pp. 57-58.

[2] *Subtleties*, VIII, 1.

[3] *Ibid.*, I, 56.

[4] *Ibid.*, III, 25.

[5] *Ibid.*, V, 1 and 4.

[6] *Ibid.*, IV, 10.

[7] *Ibid.*, IX, 8.

Stars and fallen angels: sin and natur

It is perhaps not very surprising that we should find in Hildegard's works notions concerning nature which we met back in the Enoch literature, since some of her writings take the same form of recorded visions as Enoch's, while one of them, the *Liber vitae meritorum,* is equally apocalyptic. At any rate, in the *Scivias* in the second vision, where Lucifer is cast out of glory because of his pride, the fallen angels are seen as a great multitude of stars, as in the *Book of Enoch,* and we are told that the four elements were in harmony before Lucifer's fall.[1] The disturbing effect of sin, even human, upon nature is again stated in the *Causae et curae,* where it is said that normally the elements serve man quietly and perform his works. But when men engage in wars and give way to hate and envy, the elements are apt to rage until men repent and seek after God again.[2] In the *Liber vitac meritorum,* too, the elements complain that they are overturned and upset by human depravity and iniquity.[3]

Nature in Adam's time: the antediluvian period.

The influence of the Christian religion is further shown and that of the Bible in particular is manifested by numerous allusions to Adam and the earliest period of Biblical history, but very few of them find any justification in the scriptural narrative. Thus the *Liber divinorum operum* states [4] that after the fall of Adam and before the deluge the sun and moon and planets and other stars were "somewhat turbulent from excessive heat," and that the men of that time possessed great bodily strength in order that they might endure this heat. The deluge reduced the temperature and men since have been weaker. In the preface to the fifth book of the *Subtletics* we are told that there are certain plants which fish eat, and which, if man could procure and eat, would enable him to go without food for four or five months. Adam used to eat them at times after he had been cast out of Eden, but not when he could get enough other food, as they make the flesh tough. In the preface to the eighth book Hildegard says that all creatures were good before Adam's fall, but when Abel's blood stained the soil noxious humors arose from which venomous and deadly reptiles were generated. These perished in the deluge, but others were generated from their putrefying carcasses. In the *Causae et curae*, too, the names of Adam and Eve occasionally appear in the chapter headings, for instance, "Of Adam's fall and of melancholy." [1]

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[1] Migne, 387-9.

[2] (1903) p. 57.

[3] II, 1, "Querela elementorum. 'Nam homines pravis operibus suis velut molendinum subvertunt nos.' III, 23, "Quod elementa humanis iniquitatibus subvertuntur."

[4] Migne, 966.

Spiritual lessons from natural phenomena.

Hildegard also held the view, common among medieval Christian writers, that one purpose of the natural world about us is to illustrate the spiritual world and life to come, and that invisible and eternal truths may be manifested in visible and temporal objects. In the *Scivias* she hears a voice from heaven saying, "God who established all things by His will, created them to make His Name known and honored, not only moreover showing in the same what are visible and temporal, but also manifesting in them what are invisible and eternal." [2] But neither Hildegard nor medieval Christians in general thought that the only purpose of natural phenomena and science was to illustrate spiritual truth and point a moral. But this always constituted a good excuse which sounded well when one of the clergy wished to investigate or write about things of nature. Not that we mean to question the sincerity of the medieval writers one whit more than that of certain "Christian colleges" of the present which deem it wise to demonstrate their piety and orthodoxy by maintaining compulsory chapel attendance and holding an occasional "Convocation." But certainly our abbess of Bingen in the course of her writings, especially the *Subtleties* and *Causae et curae*, lists many natural phenomena and medical recipes without making any mention of what spiritual truth they may or may not illustrate.

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[1] (1903), p. 143.

[2] Migne, 404-405.

Hildegard's attitude toward magic.

Associating natural substances as much with the devil or spirits of the air as she does, it is not surprising that Hildegard believes in the reality of magic and has something to say about it. Magic is regarded by Hildegard as an evil and diabolical art. She describes it in a vision of the *Scivias,* where God Himself is represented as speaking, as the art of seeing and hearing the devil, which was taught to men by Satan himself.[1] Similarly in the *Liber divinorum operum* it is stated that Antichrist will excel "in all diabolical arts" and in "the magic art." [2] This was of course the usual Christian view. In the *Liber vitae meritorum* with more apparent originality Magic or *Maleficium* is presented as one of the personified Vices and is allowed to speak for itself. It is represented as having the body of a dog, the head of a wolf, and the tail of a lion. This beast or image speaks in its own praise and defense as follows.

Magic Art's defense

"Of Mercury and other philosophers I will say many things, who by their investigations harnessed the elements in such wise that they discovered most certainly everything that they wished. Those very daring and very wise men learned such things partly from God and partly from evil spirits. And why shouldn't they? And they named the planets after themselves, since they had made many investigations and learned a great deal concerning the sun and moon and stars. I, moreover, rule and reign wherever I list in those arts, forsooth in the heavenly luminaries, in trees and herbs and all that grows in the earth, and in beasts and animals upon the earth, and in worms both above and below the earth. And on my marches who is there that resists me? God created all things, so in these arts I do Him no injury. For He wishes it, as is proved in His scriptures and perfect works. And what would be the advantage, if His works were so blind that no cause could be studied in them? There wouldn't be any." [3]

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[1] Vision III, Migne, 410.

[2] Vision X, 28 and 32, Migne, 1028 and 1032.

[3] Pitra (1882) *Vitae meritorum,* V, 6-7.

True Worship's reply to Magic.

To this bold attempt of Magic to identify itself with scientific investigation, the True Worship of God responds with the counter question, "Whether it is more pleasing to God to adore Him or His works?" and reminds *Maleficium* that mere creatures which proceed from God can give life to no one and that man is the only rational created being. "You, moreover, O Magic Art, have the circle without the center, and while you investigate many problems in the circle of creation . . . you have robbed God of His very name." This reply does not seem to separate magic and scientific investigation or to deny Magic's claim that they are identical, and its force would seem about as cogent against science as against magic. But a little later in the same work Hildegard reverts to her former charge that *maleficium* is "by diabolical arts," and that its devotees "by directing all their works to impurity turn their science also to the pursuit of evils." "For they name demons as their gods and worship them instead of God."[1]

Magic properties of natural substances.

That magic, however diabolical it may be, does employ natural forces and substances, is not only asserted by Magic Art itself, but freely admitted by Hildegard in her discussions of the properties of animals, plants, and minerals in her other two works, the *Subtleties of Diverse Creatures* and *Cases and Cures.* In the latter work she states that while herbs in the east are full of virtue and have a good odor and medicinal properties, those in the west are potent in the magic art and for other phantasms but do not contribute much to the health of the human body.[2] In the former work she tells that the tree-toad is much employed in diabolical arts, especially when the trees are beginning to leaf and blossom, since at this time the spirits of the air are especially active.[3] Sometimes, however, there is a way to remove this magic virtue from a natural substance. The root mandragora "is no longer efficacious for magic and fantastic purposes," if it is purified in a fountain for a day and a night immediately after it has been dug from the earth.[1]

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[1] *Vitae meritorum,* V, 32.

[2] *Causae et curae* (1903) 31-32.

[3] *Subtleties,* VIII, 6.

Instances of counter-magic.

There are also substances which counteract magic. It has little force in any place where a fir-tree grows, for the spirits of the air hate and avoid such spots.[2] In the *Causae et curae* Hildegard tells how to compound a powder "against poison and against magic words." [3] It also "confers health and courage and prosperity on him who carries it with him." First one takes a root of geranium (*storkesnabil*) with its leaves, two mallow plants, and seven shoots of the plantagenet. These must be plucked at midday in the middle of April. Then they are to be laid on moist earth and sprinkled with water to keep them green for a while. Next they are dried in the setting sun and in the rising sun until the third hour, when they should once more be laid on moist earth and sprinkled with water until noon. Then they are to be removed and placed facing the south in the full sunshine until the ninth hour, when they should be wrapped in a cloth, with a stick on top to hold them in place, until a trifle before midnight. Then the night begins to incline towards day and all the evils of darkness and night begin to flee. A little before midnight, therefore, they should be transferred to a high window or placed above a door or in some garden where the cool air may have access to them. As soon as midnight is passed, they are to be removed once more, pulverized with the middle finger, and put in a new pill-box with a little *bisemum* to keep them from decaying but not a sufficient quantity to overcome the scent of the herbs. A little of this powder may be applied daily to the eyes, ears, nose, and mouth, or it may be bound on the body as an antiaphrodisiac, or it may be held over wine without touching it but so that its odor can reach the wine, which should then be drunk with a bit of saffron as a preventive of indigestion, poison, magic, and so forth.

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[1] *Subtleties,* I, 56.

[2] *Ibid.,* III, 23.

[3] (1903), p. 196.

Ceremony with a jacinth and wheaten loaf.

In the *Subtilitates*[1] the following procedure is recommended, if anyone is bewitched by phantasms or magic words so that he goes mad. Take a wheaten loaf and cut the upper crust in the form of a cross. First draw a jacinth through one line of the cross, saying, "May God who cast away all the preciousness of gems from the devil when he transgressed His precept, remove from you N. all phantasms and magic words and free you from the ill of this madness." Then the jacinth is to be drawn through the other arm of the cross and this formula is to be repeated, "As the splendor which the devil once possessed departed from him because of his transgression, so may this madness which harasses N. by varied phantasies and magic arts be removed from you and depart from you." The ceremony is then completed by the bewitched person eating the bread around the cross.

Hildegard's superstitious procedure.

These two illustrations make it apparent that Hildegard has a licit magic of her own which is every whit as superstitious as the magic art which she condemns. It is evident that she accepts not only marvelous and occult virtues of natural substances such as herbs and gems, but also the power of words and incantations, and rites and ceremonies of a most decidedly magical character. In the second passage this procedure assumed a Christian character, but the plucking and drying of the herbs in the first passage perhaps preserves the flavor of primitive Teutonic or Celtic paganism. Nor is such superstitious procedure resorted to merely against magic, to whose operations it forms a sort of homeopathic counterpart. It is also employed for ordinary medicinal purposes, and is a characteristic feature of Hildegard's conception of nature and whole mental attitude. This we may further illustrate by running through the books of the *Subtilitates*.

Use of herbs.

Except for passages connecting the devil with certain herbs which we have already noted, Hildegard's discussion of vegetation is for the most part limited to medicinal properties of herbs, which are effective without the addition of fantastic ceremonial. Sometimes nevertheless the herbs are either prepared or administered in a rather bizarre fashion. Insanity may be alleviated, we are told, by shaving the patient's head and washing it in the hot water in which *agrimonia* has been boiled, while the hot herbs themselves are bound in a cloth first over his heart and then upon his forehead and temples.[1] An unguent beneficial alike for digestive and mental disorders is made of the bark, leaves, and bits of the green wood of the fir-tree, combined with saliva to half their weight. This mess is to be boiled in water until it becomes thick, then butter is to be added, and the whole strained through a cloth.[2] The mandragora root should first be worn bound between the breast and navel for three days and three nights, then divided in halves and these bound on the thighs for three days and three nights. Finally the left half of the root, which resembles the human figure, should be pulverized, camphor added to it, and eaten.[3] If a man is always sad and in the dumps, after purifying the mandragora root in a fountain, let him take it to bed with him, hold it so that it will be warmed by the heat of his body, and say, "God, who madest man from the dust of the earth without grief, I now place next me that earth which has never transgressed"—Hildegard has already stated that the mandragora is composed "of that earth of which Adam was created"—"in order that my clay may feel that peace just as Thou didst create it." That the prayer or incantation is more essential than the virtue of the mandragora in this operation, is indicated by the statement that shoots of beech, cedar, or aspen may be used instead of the mandragora.

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[1] IV, 2.

Marvelous virtues of gems.

Other marvelous effects than routing the devil, which Hildegard attributes to gems in the course of the fourth book of the *Subtilitates*, are to confer intellect and science for the day, to banish anger and dulness, bestow an equable temper, restrain lust, cure all sorts of diseases and infirmities, endow with the gift of sound speech, prevent thefts at night, and enable one to fast. These marvelous results are produced either by merely having the stone in one's possession, or by holding it in the hand, placing it next the skin, taking it to bed with one and warming it by the heat of the body, breathing on it, holding it in the mouth especially when fasting, suspending it about the neck, or making the sign of the cross with it. In the cure of insanity by use of the magnet the stone should be moistened with the patient's saliva and drawn across his forehead while an incantation is repeated.[1] A man may be brought out of an epileptic fit by putting an emerald in his mouth.[2] Having recovered, he should remove the gem from his mouth and say, "As the spirit of the Lord filled the earth, so may His grace fill the temple of my body that it may never be moved." This ceremony is to be repeated on nine successive mornings, and that here the gem is as important as the prayer is indicated by the direction that the patient should have the gem with him each time and take it out and look at it as he repeats the incantation. Different is the procedure for curing epilepsy by means of the gem *achates.*[3] In this case the stone should be soaked in water for three days at the full moon; this water should be slightly warmed, and then preserved, and all the patient's food cooked in it *dum luna tota crescat.* The gem should also be placed in everything that he drinks. This astrological procedure is to be repeated for ten months.

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[1] *Subtleties*, I, 114.

[2] *Ibid.*, III, 23.

[3] *Ibid.*, I, 56.

Remarkable properties of fish.

We have already heard that certain fish have the property of expelling demons. Fish also have other remarkable virtues. The eye of a *copprea,* worn in a gold or silver ring so that it touches one's finger, arouses a sluggish intellect.[4] The lung of a tunny fish, taken in water, is good for a fever, and it keeps one in good health to wear shoes and a belt made of its skin.[5] Pulverized salmon bones are recommended for bad teeth.[1] But eating the head of a *barbo* gives one a headache and fever.[2] Hildegard also tells some wonderful stories concerning the modes of generation of different varieties of fish. In the *Causae et curae* [3] for dimness of the eyes it is recommended to dry some walrus skin in the sun, soften it in pure wine, and apply it in a cloth between the eyes at night. It should be removed at midnight and applied only on alternate nights for a week. "Either it will remove dimness of the eyes, or God does not permit this to be done."

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[1] *Subtleties,* IV, 18.
[2] *Ibid.,* IV, 1.
[3] *Ibid.,* IV, 16.
[4] *Ibid.,* V, 8.
[5] *Ibid.,* V, 1.

Use of the parts of birds.

To render available or to enhance the occult virtues of birds Hildegard suggests a great amount of complicated ceremonial. The heart of a vulture, split in two, dried before a slow fire and in the sun, and worn sewn up in a belt of doeskin, makes one tremble in the presence of poison.[4] This is explained by the vulture's own antipathy to poison, which is increased and purified by the fire, sun, and especially by the belt, for the doe is swifter and more sensitive than other animals. Mistiness is marvelously removed from the eyes by catching a nightingale before daybreak, adding a single drop of dew found on clean grass to its gall, and anointing the eyebrows and lashes frequently with the same.[5] Another eye-cure consists in cooking a heron's head in water, removing its eyes, alternately drying them in the sun and softening them in cold water for three successive times, pulverizing and dissolving them in wine, and at night frequently touching the eyes and lids with the tip of a feather dipped in this concoction.[6] The blood of a crane, dried and preserved, and its right foot are employed in varied ways to facilitate child-birth.[7] Hildegard also often tells how to make a medicinal unguent by cooking some bird in some prescribed manner and then pulverizing certain portions of the carcass with various herbs or other animal substances.[8] Even without the employment of ceremonial sufficiently remarkable powers are attributed to the bodies or parts of birds. Eating the flesh of one reduces fat and benefits epileptics, while eating its liver is good for melancholy.[1] The liver of a swan has the different property of purifying the lungs, while the lung of a swan is a cure for the spleen.[2] Again, a heron's liver cures stomach trouble, while a cure for spleen is to drink water in which its bones have been stewed, and if one who is sad eats its heart, it will make him glad.[3]

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[1] *Subtleties*, V, 5.
[2] *Ibid.*, V, 10.
[3] (1903), pp. 193-4.
[4] *Subtleties*, VI, 7.
[5] *Ibid.*, VI, 49.
[6] *Ibid.*, VI, 6.
[7] *Ibid.*, VI, 4.
[8] *Ibid.*, VI, 5, 20, 40.

Cures from quadrupeds.

Hildegard's chapters on quadrupeds are so delightfully quaint that I cannot pass them over, although the properties which she attributes to them and the methods by which their virtues are utilized are not essentially different from those in examples already given. The camel, however, is peculiar in that its different humps have quite different virtues.[4] The one next to its neck has the virtues of the lion; the second, those of the leopard; the third, those of the horse. A cap of lion's skin cures ailments of the head whether physical or mental.[5] Deafness may be remedied by cutting off a lion's right ear and holding it over the patient's ear just long enough to warm it and to say, "Hear *adimacus* by the living God and the keen virtue of a lion's hearing." This process is to be repeated many times. The heart of a lion is somewhat similarly employed, but without any incantation, to make a stupid person prudent. Burying a lion's heart in the house is regarded as fire insurance against its being struck by lightning, "for the lion is accustomed to roar when he hears thunder." Digestion is aided by drinking water in which the dried liver of a lion has been left for a short time. Placing a bit of the skin from between a bear's eyes over one's heart removes timidity and anxiety.[6] If anyone suffers from paralysis or one of those changeable diseases which wax and wane with the moon like lunacy, let him select a spot where an ass has been slain, or has died a natural death, or has wallowed, and let him spread a cloth on the grass or ground and repose there a short time and sleep if he can. Afterwards you should take him by the right hand and say, "Lazarus slept and rested and rose again; and as Christ roused him from foul decay, so may you rise from this perilous pestilence and the changing phases of fever in that conjunction in which Christ applied Himself to the alleviation of such complaints, prefiguring that He would redeem man from his sins and raise him from the dead." With a brief interval of time allowed between, the same performance is to be repeated thrice in the same place on the same day, and then again thrice on the next and the third days, when the patient will be cured.[1]

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[1] *Subtleties*, VI, 2.

[2] *Ibid.*, VI, 5.

[3] *Ibid.*, VI, 6.

[4] *Ibid.*, VII, 2.

[5] *Ibid.*, VII, 3.

[6] *Ibid.*, VII, 4.

The unicorn, weasel, and mouse.

The liver and skin of the unicorn have great medicinal virtues, but that animal can never be caught except by means of girls, for it flees from men but stops to gaze diligently at girls, because it marvels that they have human forms, yet no beards. "And if there are two or three girls together, it marvels so much the more and is the more quickly captured while its eyes are fixed on them. Moreover, the girls employed in capturing it should be of noble, not peasant birth, and of the middle period of adolescence." [2] When one weasel is sick, another digs up a certain herb and breathes and urinates on it for an hour, and then brings it to the sick weasel who is cured by it.[3] But what this herb is is unknown to men and other animals, and it would do them no good if they did know it, since its unaided virtue is not efficacious, nor would the action of their breath or urine make it so. But the heart of a weasel, dried and placed with wax in the ear, benefits headache or deafness, and the head of a weasel, worn in two pieces in a belt next the skin, strengthens and comforts the bearer and keeps him from harm. The mouse, besides being responsible for two other equally marvelous cures, is a remedy for epilepsy. "For inasmuch as the mouse runs away from everything, therefore it drives away the falling disease." [4] It should be put in a dish of water, and the patient should drink some of this water and also wash his feet and forehead in it.

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[1] *Subtleties,* VII, 9.

[2] *Ibid.,* VII, 5.

[3] *Ibid.,* VII, 38.

[4] *Ibid.,* VII, 39.

What animals to eat and wear.

Hildegard gives some strange advice what animal products to eat and wear. "Sheepskins are good for human wear, because they do not induce pride or lust or pestilence as the skins of certain other animals do."[1] Pork is not good for either sick or healthy persons to eat, in her opinion, while beef, on account of its intrinsic cold, is not good for a man of cold constitution to eat.[2] On the other hand, she recommends as edible various birds which would strike the modern reader as disgusting.[3]

Insects and reptiles.

Fleas remain underground in winter but come forth to plague mankind when the sun dries the soil in summer. But one may be rid of them by heating some earth until it is quite dry and then scattering it upon the bed.[4] Hildegard also describes a complicated cure for leprosy by use of the earth from an ant-hill.[5] If a man kills a certain venomous snake just after it has skinned itself in the cleft of a rock, and cautiously removes its heart and dries the same in the sun, and then preserves it in a thin metal cover, it will serve as an amulet. Holding it in his hand will render him immune to venom and cheer him up if he becomes gloomy or sorrowful.[6]

Animal compounds.

In the *Causae et curae* Hildegard combines the virtues of parts of a number of animals into one composite medicine for epilepsy.[7] Four parts of dried mole's blood are used because the mole sometimes shows himself and sometimes hides, like the epilepsy itself. Two parts of powdered duck's bill are added because the duck's strength is in its beak, "and because it touches both pure and impure things with its bill, it is repugnant to this disease which is sudden and silent." One portion of the powdered claws of a goose, minus the skin and flesh, is added for much the same reason, and the claw of a goose rather than a gander is required because the female bird is the more silent of the two. These constituents are bound together in a cloth, placed for three days near a recent molecast,—for such earth is more wholesome, then are put near ice to cool and then in the sun to dry. Cakes are then to be made with this powder and the livers of some edible animal and bird and a little meal and cummin seed, and eaten for five days. Against diabolical phantasms is recommended a belt made of the skin of a roebuck, which is a pure animal, and of the skin of the *helun*, which is a brave beast, and hence both are abhorred by evil spirits.[1] The two strips of skin are to be fastened together by four little steel[2] nails, and as each is clasped one repeats the formula, "In the most potent strength of almighty God I adjure you to safeguard me"; only in the second, third, and fourth instance instead of saying "I adjure" (*adiuro*), the words *benedico, constituo,* and *confirmo* are respectively substituted. One should be girded with this belt night and day, and magic words will not harm one.

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[1] *Subtleties*, VII, 16.
[2] *Ibid.*, VII, 17.
[3] *Ibid.*, VII, 14.
[4] *Ibid.*, VII, 42.
[5] *Ibid.*, VII, 43.
[6] *Ibid.*, VIII, 2.
[7] (1903), pp. 206-7.

Magic and astrology closely connected.

We have already encountered more than one instance of observance of the phases of the moon in Hildegard's medicinal and magical procedure, and have met in one of her formulae a hint that Christ employed astrological election of a favorable conjunction in performing His miracles. Thus as usual the influence of the stars is difficult to separate from other occult virtues of natural substances, and we may complete our survey of Hildegard's writings by considering her views concerning the celestial bodies and divination of the future.

Astrology and divination condemned.

In the passage of the *Scivias* to which we have already referred God condemned astrology and divination as well as magic.[3] *Mathematici* are called "deadly instructors and followers of the Gentiles in unbelief," and man is reproved for believing that the stars allot his years of life and regulate all human actions, and for cultivating in the place of his Creator mere creatures such as the stars and heavens, which cannot console or help him, or confer either prosperity or happiness. Man should not consult the stars as to the length of his life, which he can neither know beforehand nor alter. He should not seek signs of the future in either stars or fire or birds or any other creature. "The error of augury" is expressly rebuked. Man should abstain not only from worshiping or invoking the devil but from making any inquiries from him, "since if you wish to know more than you should, you will be deceived by the old seducer."

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[1] (1903), pp. 194-5.

[2] (1903), p. 195, "Nam calibs est firmamentum et ornamentum aliarum rerum et est quasi quaedam adiunctio ad vires hominis quemadmodum homo fortis est."

[3] Migne, 409-14; I alter the order somewhat in my summary.

Signs in the stars.

It is true that sometimes by divine permission the stars are signs to men, for the Son of God Himself says in the Gospel by Luke that "There shall be signs in the sun and moon and stars," and His incarnation was revealed by a star. But it is a stupid popular error to suppose that other men each have a star of their own, and, continues God, speaking through the medium of Hildegard, "That star brought no aid to My Son other than that it faithfully announced His incarnation to the people, since all stars and creatures fear Me and simply fulfill My dictates and have no signification of anything in any creature." This last observation receives further interpretation in a passage of the *Causae et Curae*[1] which explains that the stars sometimes show many signs, but not of the future or hidden thoughts of men, but of matters which they have already revealed by act of will or voice or deed, so that the air has received an impression of it which the stars can reflect back to other men if God allows it. But the sun and moon and planets do not always thus portray the works of men, but only rarely, and in the case of some great event affecting the public welfare.

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[1] (1903), p. 15.

Superiors and inferiors; effect of stars and winds on elements and humors.

If the stars do not even signify the fate and future of man, they are none the less potent forces and, under God, causes in the world of nature. "God who created all things," writes Hildegard in the *Liber divinorum operum*,[1] "so constituted superiors that He also strengthens and purifies things below through these, and in the human form introduces also those things allotted for the soul's salvation." This passage has two sides; it affirms the rule of superiors over inferiors, but it makes special provision for the salvation of the human soul. And thus it is a good brief summary of Hildegard's position. Sun, moon, and stars are represented as by the will of God cooperating with the winds—which play an important part in Hildegard's cosmology—in driving the elements to and fro;[2] and the humors in the human body now rage fiercely like the leopard, now move sluggishly like the crab, now proceed in other ways analogous to the wolf or deer or bear or serpent or lamb or lion—animals whose heads, belching forth winds, are seen in the vision about the rim of the heavenly spheres.[3] They suggest the influence of the signs of the zodiac, although there appears to be no exact correspondence to these in Hildegard's visionary scheme of the universe as detailed in the *Liber divinorum operum*. In the *Causae et curae*, on the other hand, she gives a detailed account of how pairs or triplets of planets accompany the sun through each of the twelve signs.[4] In other passages [5] she affirms that the sun and moon serve man by divine order, and bring him strength or weakness according to the temper of the air.

Influence of the moon on human health and generation.

Hildegard more especially emphasizes the influence of the moon, in which respect she resembles many an astrologer. In the *Causae et curae* [6] she states that some days of the moon are good, others bad; some, useful and others, useless; some, strong and others, weak. "And since the moon has this changeability in itself, therefore the moisture in man has its vicissitudes and mutability in pain, in labor, in wisdom, and in prosperity." Similarly in the *Liber divinorum operum* [1] it is noted that human blood and brain are augmented when the moon is full and diminish as it wanes, and that these changes affect human health variously. Sometimes one incurs epilepsy when the moon is in eclipse.[2] The moon is the mother of all seasons. Hildegard marvels in the *Causae et curae* [3] that while men have sense enough not to sow crops in mid-summer or the coldest part of winter, they persist in begetting offspring at any time according to their pleasure without regard either to the proper period of their own lives or to the time of the moon. The natural consequence of their heedlessness is the birth of defective children. Hildegard then adds [4] by way of qualification that the time of the moon does not dominate the nature of man as if it were his god, or as if man received any power of nature from it, or as if it conferred any part of human nature. The moon simply affects the air, and the air affects man's blood and the humors of his body.

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[1] Migne, 807.
[2] Migne, 791 and 798.
[3] Migne, 732 et seq.
[4] (1903), pp. 11-14.
[5] Migne, 778.
[6] (1903), pp. 16-17.

Relations of the four humors to human character and fate.

Hildegard, however, not only believed that as the humors were perturbed and the veins boiled, the health of the body would be affected and perhaps a fever set in,[5] but also that passions, such as wrath and petulance, were thereby aroused and the mind affected.[6] This is suggested in a general way in the *Liber divinorum operum,* but is brought out in more detail in the *Causae et curae,* where various types of men are delineated according to the combinations of humors in their bodies, and their characters are sketched and even their fate to some extent predicted therefrom. In one case [7] "the man will be a good scholar, but headlong and too vehement in his studies, so that he scatters his knowledge over too wide a field, as straw is blown by the wind; and he seeks to have dominion over others. In body he is healthy except that his legs are weak and he is prone to gout; but he can live a long while, if it so please God." Such a passage hardly sounds consistent with Hildegard's statement elsewhere already noted that man cannot know the length of his life beforehand. In the case of choleric, sanguine, melancholy, and phlegmatic men[1] Hildegard states what the relations of each type will be with women and even to some extent what sort of children they will have. She also discusses four types of women in very similar style.[2] These are not exactly astrological predictions, but they have much the same flavor and seem to leave little place for freedom of the will.

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[1] Migne, 779.

[2] Migne, 793.

[3] (1903), pp. 17-18; and again 77-78; see also p. 97, *"de conceptu in plenilunio."*

[4] (1903), p. 19.

[5] Migne, 793.

[6] (1903), p. 19.

[7] (1903), p. 54.

Hildegard's varying position.

In one passage, however, Hildegard comfortingly adds that nevertheless the Holy Spirit can penetrate the whole nature of man and overcome his mutable nature as the sun dispels clouds, and so counteract the moist influence of the moon. She also states concerning the significations of the stars concerning man's future, "These significations are not produced by the virtue of the planets themselves alone or stars or clouds, but by the permission and will and decree of God, according as God wished to demonstrate to men the works of the same, just as a coin shows the image of its lord."[3] In another passage, on the other hand, Hildegard recognizes, like Aquinas later, that it is only rarely and with difficulty that the flesh can be restrained from sinning.[4]

Nativities for the days of the moon.

Finally, the *Causae et curae* close with predictions for each day of the moon of the type of male or female who will be conceived on that day.[5] Selecting the eighteenth day by lot as an example of the others, we read that a male conceived then will be a thief and will be caught in the act and will be deprived of his landed property so that he possesses neither fields nor vineyards, but strives to take from others what is not his. He will be healthy in body and live a long life, if left to himself. A woman conceived on that day will be cunning and deceitful of speech and will lead upright men to death if she can. She too will be sound of body and naturally long-lived, but sometimes insane. Hildegard then seems to feel it advisable to add, "But such morals, both in men and in women, are hateful to God."

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[1] *Causae et curae* (1903), pp. 70-76.

[2] *Ibid.*, pp. 87-9.

[3] *Ibid.*, pp. 19-20.

[4] *Ibid.*, p. 84.

[5] *Ibid.*, pp. 235-42.

Man the microcosm.

The theory of macrocosm and microcosm had a considerable attraction for Hildegard. At the beginning of the *Causae et curae* she exclaims, "O man, look at man! For man has in himself heavens and earth . . . and in him all things are latent." [1] Presently she compares the firmament to man's head, sun, moon, and stars to the eyes, air to hearing, the winds to smelling, dew to taste, and "the sides of the world" to the arms and sense of touch. The earth is like the heart, and other creatures in the world are like the belly.[2] In the *Liber divinorum operum* she goes into further detail. Between the divine image in human form which she sees in her visions and the wheel or sphere of the universe she notes such relationships as these. The sun spreads its rays from the brain to the heel, and the moon directs its rays from the eyebrows to the ankles.[3] Elsewhere she says, "The eyebrows of man declare the journeyings of the moon, namely, the one route by which it approaches the sun in order to restore itself, and the other by which it recedes after it has been burnt by the sun." [4] Again, from the top of the cerebral cavity to "the last extremity of the forehead" there are seven distinct and equal spaces, by which are signified the seven planets which are equidistant from one another in the firmament.[5] An even more surprising assumption as to astronomical distances is involved in the comparison [6] that as the three intervals between the top of the human head and the end of the throat and the navel and the groin are all equal, so are the spaces interven-

[1] (1903), p. 2.

[2] (1903), p. 10.

[3] Migne, 779.

[4] Migne, 833.

[5] Migne, 819.

[6] Migne, 943.

ing between the highest firmament and lowest clouds and the earth's surface and center. Corresponding to these intervals Hildegard notes three ages of man, infancy, adolescence, and old age. One more passage may be noted, since it also involves a similar explanation of weeping for joy to that given by Adelard of Bath. As the heart is stirred by emotion, whether of joy or of sorrow, humors are excited in the lungs and breast which rise to the brain and are emitted through the eyes in the form of tears. And in like manner, when the moon begins to wax or wane, the firmament is disturbed by winds which raise fogs from the sea and other waters.[1]

Divination in dreams.

If Hildegard resorts to a magic of her own in order to counteract the diabolical arts, and if she accepts a certain amount of astrological doctrine for all her censure of it, it is not surprising to find her in the *Causae et curae* saying a word in favor of natural divination in dreams despite her rejection of augury and such arts. She believes that, when God sent sleep to Adam before he had yet sinned, his soul saw many things in true prophecy, and that the human soul may still sometimes do the same, although too often it is clouded by diabolical illusions.[2] But when the body is in a temperate condition and the marrow warmed in due measure, and there is no disturbance of vices or contrariety of morals, then very often a sleeper sees true dreams.[3] Hildegard's own visions, as we have seen, came to her in her waking hours.

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[1] Migne, 829.

[2] (1903), p. 82.

[3] (1903), p. 83.

CHAPTER XLI

JOHN OF SALISBURY

His picture of the learned world—Chief events of his life—General character of the *Polycraticus*—Magic, *maleficia,* and *mathematica*—Use of Isidore on magic—Relation of Thomas Becket to John's discussion—Inconsistent Christian attitude toward superstition—Divine and natural signs—Miracle and occult virtue—Interpretation of dreams—Dreams of Joseph and Daniel—The witchcraft delusion—Prevalence of astrology—John's attack upon it—Does astrology imply fatal necessity?—John's lame conclusion—Other varieties of magic—Thomas Becket's consultation of diviners—Witch of Endor: exorcisms—Divination from polished surfaces—Natural science and medicine—Summary.

His picture of the learned world.

In 1159 John of Salisbury completed his two chief works, the *Metalogicus* and the *Polycraticus*.[1] In the former he tells the interesting story of his education in the schools of northern France, and describes the teachers and methods of the humanistic school of Chartres and the schools of logic at Paris. This valuable picture of educational conditions in the middle of the twelfth century has already supplied us with a number of bits of information concerning authors of whom we have treated. Its importance in the history of the study of the classics and of scholasticism has long been recognized, and its content has often been reproduced in secondary works, so that we need not dwell upon it specifically here.[2] Moreover, although John spent some twelve years in his studies in France, he appears from his own statements to have passed from the study of logic and "grammar" to that of theology without devoting much attention to natural science,[1] although he received some instruction in the Quadrivium from Richard Bishop and Hardewin the Teuton. He was, it is true, according to his own statement, a pupil of William of Conches for three years, but he always alludes to William as a grammarian, not as a writer on natural philosophy and astronomy. This one-sided description of William's teaching warns us not to place too implicit faith in John's account of the learned world of his times. Even if reliable as it stands, it is not in itself a complete or adequate picture. In the *Polycraticus,* however, he engages in a rather long discussion of magic, astrology and other forms of divination which it behooves us to note.

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[1] *Johannis Sarisberiensis Episcopi Carnotensis Policratici sive de nugis curialium et vestigiis philosophorum libri VIII.* Recog. C. C. I. Webb. 2 vols. Oxford, 1909. The work is also contained in Migne, PL vol. 199. For John's life see DNB. All references are to book and chapter of the *Polycraticus* unless otherwise stated.

[2] The most recent discussion of it is by R. L. Poole, "The Masters of the Schools at Paris and Chartres in John of Salisbury's Time," in EHR XXXV (1920), 321-42.

Chief events of his life.

John tells us that he was a mere lad when in 1136 he first came from England to Gaul to hear the famous Abelard lecture. Like many medieval students, he was or soon came to be in a needy condition and eked out a living at one time by tutoring the sons of nobles. During the time that had elapsed between his long training in the liberal arts and theology and his writing of the *Metalogicus* in 1159, he had led a busy life in the employ of Theobald, archbishop of Canterbury, crossing the Alps ten times, journeying twice all the way from England to Apulia, and frequently traveling about England and what is now France (John says, "the Gauls"—*Gallias*). In 1159 he addressed the *Polycraticus* to Thomas Becket, then absent with Henry II as his chancellor at the siege of Toulouse. Thomas was just about John's age and, before he became chancellor in 1154 at the age of thirty-six, had been like John first a student and then in the employ of Archbishop Theobald. John sided with Thomas Becket in the struggle with Henry II, retired to France, and returned to England with him in 1170. In 1176 he crowned his career by becoming bishop of Chartres where perhaps some years of his early studies had been spent. His death was in 1180.

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[1] *Metalog.* II, 10.

General character of the *Polycraticus.*

In the *Metalogicus* John tells us that he has scarcely touched a book of logic since he left the *palaestra* of the dialecticians so many years ago, but he returns to the subject again in that work. In the *Polycraticus* his literary tastes and interests are more manifest. He writes a good Latin style and shows a wide acquaintance with classical authors and ancient history as well as with patristic literature. The character and content of the *Polycraticus* is more clearly suggested by its sub-title, "Courtiers' Trifles and Philosophers' Footprints" (*De nugis curialium et vestigiis philosophorum*). In part it is satirical, although there is considerable serious discussion of the state and philosophy and much moralizing for the benefit of contemporary courts and statesmen. John confesses that the entire work is little more than a patch-work of other men's opinions, sometimes without specific acknowledgment of the authorities. He professes to believe that Thomas will recognize the sources of these passages without being told, while other readers who are more ignorant will be thereby spurred on to wider reading. These quotations, moreover, are either from ancient classical or comparatively early Christian writers. John does not epitomize recent literature and thought, although he makes application of the thought of the past to contemporary society and politics, and although he shows some acquaintance with the works of contemporary writers such as Bernard Silvester. In the main his attitude is essentially conservative; he repeats traditional views in an attractive but somewhat dilettante literary form, with such rational criticism as a study of the classics might be expected to produce when qualified by scrupulous adherence to medieval Christian dogma. This is especially true of his discussion of the magic arts and astrology.

Magic, *maleficia,* and *mathematica.*

John begins to discuss magic in the first of the eight books of the *Polycraticus* after a few chapters have been taken up with such other triflings of courtiers as hunting, dicing, music, and theatrical shows and spectacles. More harmful than the illusions of the stage, he declares, are those of the magic arts and various kinds of disreputable *mathematica,* long since forbidden by the holy fathers who knew that all these *artificia,* or rather *maleficia* arose from a fatal familiarity of men and demons.[1] John thus takes as practically synonymous the three terms, *magica, mathematica* and *maleficium.* He presently explains that the word *mathesis* in one sense denotes learning in general, but that when it has a long penultima, it signifies the figments of divination,[2] which belong under magic, whose varieties are many and diverse. Thus magic is John's most general and inclusive term for all occult arts.

Use of Isidore on magic.

The account of magic in John's ninth, tenth, eleventh, and twelfth chapters is largely derived without acknowledgment from that of Isidore of Seville.[3] We have already seen how this became a stock description of the subject copied with little change by successive writers and embodied in the decretals of the church. It is rather surprising that a writer as well versed in the classics as John is generally supposed to be should not have borrowed his account more directly from some such ancient Latin writers as Pliny and Apuleius. John, however, alters the wording and arrangement and consequently the emphasis considerably. He makes it seem, for example, that several magic arts, which really have nothing to do with predicting the future, are sub-varieties of divination. He also adds some new varieties to Isidore's list of practitioners of the magic arts. The *vultivoli* try to affect men by making images of them from wax or clay. *Imaginarii,* on the other hand, make images with the intent that demons should enter these images and instruct them in regard to doubtful matters. Besides interpreters of dreams (*conjectores*) and chiromancers John further mentions *specularii* who practise divination by gazing into polished surfaces such as the edges of swords, basins, and mirrors. It was this art that Joseph is described as exercising or pretending to exercise, when he charged his brothers with having made off with the cup in which he was wont to practice divination. The thirteenth and closing chapter of John's first book is a long list of omens from Roman history and Latin literature, especially Vergil.

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[1] I, 9.

[2] At II, 18 he makes the same distinction.

[3] For Isidore's account see PL 82, 310-14.

Relation of Thomas Becket to John's discussion.

In the second book he resumes the same subject after a brief and somewhat apologetic preface in which he states that all things are of use to the wise man. Therefore he responds with alacrity to Thomas Becket's request that he publish his trifles, introducing interpreters of dreams and astrologers with some other triflers. We shall later meet with some further explanation of Thomas' interest in such matters. It is perhaps significant that John further expresses his confidence that Thomas will faithfully protect those in whom he has inspired boldness of utterance,[1] but it would be too much to assume from it that John fears any persecution because he discusses such subjects. More likely he merely shares the common medieval fear of the envious bite of critics and reviewers, or wishes to remind Thomas of his need of his patronage. At any rate he closes the prologue with the request that Thomas will correct any mistake in either book.

Inconsistent Christian attitude toward superstition.

In opening his second book John subscribes to the proverb that he who trusts in dreams and auguries will never be secure and asks—like Cicero in his *De divinatione*[2]—what possible connection there can be between sneezes, yawns, and other such things accepted as signs and the events which they are supposed to signify. With Isidore and Augustine[3] —although he names neither—he rejects those empty incantations and superstitious ligatures which the entire medical art condemns, although some call them *physica*.[1] This seems like an admirable approach to an attitude of rational criticism, but John after all may be merely repeating others' statements like a parrot, and he entirely spoils its effect by what he goes on to say. He believes that the cloak of St. Stephen raised the dead, and that such practices as saying the Lord's prayer while plucking or administering medicinal herbs, or wearing or hearing or repeating the names of the four evangelists,[2] are not only allowable but most useful. He adds further that the force of all omens depends upon the faith of the recipient.

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[1] *Polycrat.* II, prologus. "Alacres itaque exeant nugae nostrae quas serenitas tua prodire iubet in publicum, ut conjectores, mathematicos, cum quibusdam aliis nugatoribus introducant; quia quibus dedisti egrediendi audaciam, securitatis quoque fiduciam praestabis." The following words, "Connectantur ergo inferiora superioribus" seem to mean that the second book goes on where the first left off, but perhaps the suggestion of astrological doctrine is an intentional play upon words on John's part.

[2] II, 12.

[3] *De doctrina Christiana,* II, 20 in Migne, PL vol. 34.

Divine and natural signs.

Although opposing faith in omens and augury, John admits that God provides signs for His creatures, such as those of the weather which sailors and farmers learn by experience and the birds are not ignorant of, or the indications by which doctors can prognosticate the course of diseases. Unfortunately the demons also are able to show signs and thus lead men astray. Mention of signs which preceded the fall of Jerusalem then leads John into a digression for several chapters concerning the horrors of the siege itself and Vespasian and Titus, a passage which was very likely inserted because Henry II and Becket were at that very time engaged in laying siege to Toulouse.

Miracle and occult virtue.

Returning to the subject of signs, John interprets the verse in Luke, "There shall be signs in sun and moon and stars" as having reference to unnatural signs, and the obscuration of the sun during Christ's passion as not a natural eclipse.[3] John explains that by nature he means "the accustomed course of things or the occult causes of events for which a reason can be given."[4] If, however, we accept Plato's definition of nature as the will of God there will be no unnatural events. But John would distinguish between the gradual growth of leaves and fruit on tree or vine by means of roots drawing nutriment from earth's vitals and sap produced within the trunk, which is indeed marvelous and has the most occult causes, and the performance of the same process without any interval of time, which he regards as a miracle and of a divine height which transcends our understanding. After drawing this distinction between divine miracle and wonders wrought by occult virtues in nature John returns again to the subject of signs.

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[1] Thus, it will be recalled, Marcellus Empiricus and Alexander of Tralles labelled their superstitious recipes.

[2] "Capitula Evangelii."

[3] II, 11.

[4] II, 12.

Interpretation of dreams.

For some chapters the topic of dreams and their interpretation absorbs his attention,[1] and at first he discusses in an apparently credulous and approving tone "the varied significations of dreams, which both experience approves and the authority of our ancestors confirms." [2] He explains that now the dream concerns the dreamer himself, now someone else, now common interests, sometimes the public or general welfare; and he quotes Nestor to the effect that "trust is put in the king's dream concerning public matters." [3] After referring credulously to the Sibylline verses predicting Christ's incarnation, passion, and ascension, John continues his exposition of the interpretation of dreams. He explains that the season of year when one dreams, the place where one dreams, and the personal characteristics of the dreamer must all be taken into account; that sometimes interpretations should be by contraries, and again from like to like. But then he checks himself with the words: "But while we pursue these traditions of the interpreters, I fear lest we deservedly seem not so much to trace the art of interpretation, which is either no art at all or an idle one, as to dream ourselves." He adds further, "Whoever fastens his credulity to the significations of dreams evidently wanders as far from sincere faith as from the path of reason." [4]

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[1] II, 14-17.

[2] II, 14, Quis nescit somniorum varias esse significationes, quas et usus approbat et maiorum confirmat auctoritas.

[3] II, 15. Somnium . . . gerit imagines, in quibus coniectorum praecipue disciplina versatur, et nunc suum cuiusque est, nunc alienum, modo commune, interdum publice aut generale est. Ut enim ait Nestor, de statu publico regis credatur somnio.

[4] II, 17. Sed dum has coniectorum traditiones ex(s)equimur, vereor ne merito non tam con-

Dreams of Joseph and Daniel.

John then attacks the *Dream-Book of Daniel,* which he says "circulates impudently among the hands of the curious" and gives a specific interpretation for each thing imagined by the dreamer. He denies the truth and authority of the book and argues at some length that neither Joseph nor Daniel would have composed such a work, and that they interpreted dreams by divine inspiration, not by any occult art learned in Chaldea or Egypt. In the first place, the method of interpretation set forth in this book is faulty and crude. The remainder of John's argument is worth quoting in part:

"Daniel indeed had the grace to interpret visions and dreams, which the Lord inspired in him, but it is inconceivable that a holy man should reduce this vanity to an art, when he knew that the Mosaic law prohibited any of the faithful to heed dreams, being aware how Satan's satellite for the subversion of men is transformed into an angel of light and how suggestions are made by bad angels. Joseph, too, won the rule of Egypt by his ability to predict. . . . But if this could have come from any science of human wisdom, I should think that some one of his ancestors before him would have merited it, or I should think that the saint, desirous of serving science and full of pious impulses, would have left the art as a legacy, if not to the human race at large, which would nevertheless have been just, at any rate to his brothers and sons. Besides, Moses, trained in all the wisdom of the Egyptians, either was ignorant of or spurned this art, since, detesting the error of impiety, he took pains to exterminate it from among God's people. Furthermore, St. Daniel learned the studies and wisdom of the Chaldeans, which, as a saint, he would not have done, had he thought it sinful to be instructed in their lore. And he had companions in his education whom he rejoiced to have as comrades in divine law and justice. For at the same time Ananias, Axarias,

iectoriam ex(s)equi, quae aut nulla aut inania ars est, quam dormitare videamur . . . Verum quisquis credulitatem suam significationibus alligat somniorum, planum est quia tam a sinceritate fidei quam a tramite rationis exorbitat.

Misael learned whatever a Chaldean would learn. . . . But notice that the privilege which man could not confer was given to Daniel alone, to bring to light the riddles of dreams and to scatter the obscurities of figures. . . ."

Pointing out that Daniel read the king's thoughts and prophesied "the mystery of salvation" in addition to interpreting the dream, John then concludes sarcastically: "Are the interpreters of dreams thus wont to examine thoughts and remove obscurities, to explain what is involved and illuminate the darkness of figures? If there is any who enjoys a like portion of grace, let him join Daniel and Joseph and like them ascribe to God the glory. He whom the spirit of truth does not illume vainly puts his confidence in the art of dreams." [1]

The witchcraft delusion.

John concludes that many dreams are the work of demons.[2] Especially as of this sort he classifies the illusions of those who think that they have taken part during the night in witches' Sabbats. "What they suffer in spirit they most wretchedly and falsely believe to have occurred in the body.[3] And such dreams come mainly to women, feeble-minded men, and those weak in the Christian faith. Too much stress must not, however, be laid upon this apparent opposition to the witchcraft delusion.[4] John admits that the demons send dreams, and if he denies their verity, he merely repeats a hesitation as to the extent and reality of the power of demons over the body of men and the world of nature which we have frequently met in patristic literature and which is due to a natural reluctance to admit that their magic is as real as God's miracles.

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[1] *Polycrat.* II, 17. Gratian appears to refer to the same book on oneiromancy in his *Decretum*, Secunda pars, Clausa XXVI, Quaest. vii, cap. 16, "somnialia scripta et falso in Danielis nomine intitulata."

[2] II, 17 (Webb I, 100). Quis huius facti explicet rationem nisi quod boni spiritus vel maligni exigentibus hominum meritis eos erudiunt vel illudunt? . . . Quod si materiam vitiis afferat, libidinem forte accendens aut avaritiam aut dominandi ingerens appetitum aut quidquid huiusmodi est ad subversionem animae, procul dubio aut caro aut spiritus malignus immittit.

[3] II, 17 (Migne, col. 436), Webb I, 100-1.

[4] John is perhaps influenced by a similar passage in the Canon, *Ut episcopi* (Burchard, *Decreta*, X, 1).

Prevalence of astrology.

From divination by dreams and demons John passes to astrology. To start with he admits the attraction which the art has for men of intellect in his own time. "Would," he exclaims, "that the error of the *mathematici* could be as readily removed from enlightened minds as the works of the demons fade before true faith and a sane consciousness of their illusions. But in it men go astray with the greater peril in that they seem to base their error upon nature's firm foundation and reason's strength." [1] Beginning with mathematical and astronomical truths based on nature, reason and experience, they gradually slip into error, submitting human destiny to the stars and pretending to knowledge which belongs to God alone.

John's attack upon it.

John ridicules the astrologers for attributing sex to the stars and stating the exact characteristics and influences of each planet, when they cannot agree among themselves whether the stars are composed of the four elements or some fifth essence, and when they are confounded by a schoolboy's question whether the stars are hard or soft.[2] He grants that the sun's heat and the moon's control of humors as it waxes and wanes are potent forces, and that the other heavenly bodies are the causes of many utilities, and that from their position and signs the weather may be predicted. But he complains that the astrologers magnify the influence of the stars at the expense of God's control of nature and of human free will. "They ascribe everything to their constellations." Some have even reached such a degree of madness that they believe that an image can be formed in accordance with the constellations so that it will receive the spirit of life at the nod of the stars and will reveal the secrets of hidden truth."[1] Whether John has some magic automaton or merely an engraved astrological image in mind is not entirely clear.

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[1] II, 18. Possit utinam tam facile mathematicorum error a praestantioribus animis amoveri quam leviter in conspectu verae fidei et sanae conscientiae istarum illusionum demonia conquiescunt. Verumtamen eo periculosius errant quo in soliditate naturae et vigore rationis suum fundare videntur errorem.

[2] II, 19.

Does astrology imply fatal necessity?

John is aware, however, that many astrologers will deny that their science detracts in any way from divine prerogative and power, and will "appear to themselves to excuse their error quite readily" by asserting with Plotinus that God foreknew and consequently foredisposed everything that is to occur, and that the stars are as much under his control as any part of nature.[2] But John will have none of this sort of argument. "These hypotheses of theirs are indeed plausible but nevertheless venom lies under the honey. For they impose on things a certain fatal necessity under the guise of humility and reverence to God, fearing lest his intent should perchance alter, if the outcome of things were not made necessary. Furthermore, they encroach upon the domain of divine majesty, when they lay claim to that science of foreseeing times and seasons, which by the Son's testimony are reserved to the power of the Father, even to the degree that they were hid from the eyes of those to whom the Son of God revealed whatever He heard from the Father."[3]

John furthermore contends that divine foreknowledge does not require fatal necessity. For instance, although God knew that Adam would sin, Adam was under no compulsion to do so. God knew that by his guilt Adam would bring death into the world, but no condition of nature impelled him to this; in the beginning man was immortal. At this point John wanders off into a joust at the Stoics and Epicureans, whom he censures as equally in error, since the one subjected all to chance, the other to necessity. It is true, John argues, that I know a stone will fall to earth if I hurl it skywards, but it does not act under necessity, for it might fall or not." But that it does fall, "though not necessary, is true." John presently recognizes that he has given away his previous argument against astrology and that the devotee of the stars will say that he does not care whether his predictions are necessary or not provided they are true. " 'Nor does it make any difference to me,' says the devotee of the stars, 'whether the affair in question might be otherwise, provided I am not doubtful that it will be (as I think.)' "[1]

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[1] II, 19 (Migne, col. 442). Webb, I, 112. . . . stellarum nutu recipiet spiritum vitae et consulentibus occultae veritatis manifestabit arcana.

[2] II, 19.

[3] II, 20.

John's lame conclusion.

John accordingly resorts to other arguments and to facetious sarcasm to cover his confusion. Then he recovers sufficiently to reiterate his belief that God frequently interferes in the operation of nature by special providences; and asserts that God has been known to change His mind, while the astrologers assert that the stars are constant in their influences. Expressing doubt, however, whether Thomas Becket will be convinced by his arguments, especially the one concerning fate and Providence, or whether he will not laugh up his sleeve at such a clumsy attempt to refute so formidable a doctrine, John lamely concludes by citing Augustine and Gregory against the art, and by affirming that every astrologer whom he has known has come to some bad end,[2] in which assertion he probably simply echoes Tertullian.

Other varieties of magic.

Resuming his discussion of the varieties of magic John briefly dismisses necromancers with the *bon mot* that those deserve death who try to acquire knowledge from the dead.[3] A number of other terms in Isidore's list—*auspices,* augurs, *salissatores, arioli, pythonici, aruspices*—he says it is needless to discuss further since these arts are no longer practiced in his day, or at least not openly. Turning to more living superstitions of the present, he explains that chiromancy professes to discern truths which lie hidden in the wrinkles of the hands, but that since there is no apparent reason for this belief it is not necessary to contravert it.

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[1] Cap. 24, nec mea, inquit astrorum secretarius, interest an aliter esse possit, dum id de quo agitur ita futurum esse non dubitem.

[2] John's argument against astrology extends from the 18th to the 26th chapter of the second book of the *Polycraticus.*

[3] II, 27.

Thomas Becket's consultation of diviners.

John wishes to ask Thomas one thing, however, and that is what triflers of this sort say when they are interrogated concerning uncertain future matters. He knows that Becket is familiar with such men because on the occasion of a recent royal expedition against Brittany he consulted both an aruspex and a chiromancer. John notes that a few days afterwards Thomas "lost without warning the morning-star so to speak of your race," and warns him that such men by their vanity deserve to be consulted no more. This gentle rebuke did not avail, however, to wean Thomas entirely from his practice of consulting diviners, which he continued to do even after he became Archbishop of Canterbury. In a letter written to the future martyr and saint in 1170 John again chides Thomas for having delayed certain important letters because he had been "deluded by soothsayings which were not of the Spirit" and exhorts him "So let us renounce soothsayings in the future." [1]

Witch of Endor: exorcisms.

Despite his previous declaration that he need not discuss the *pythonici,* John now proceeds to do so, listing instances of ambiguous and deceptive Delphic oracles and discussing at length the well-worn subject of Saul and the witch of Endor. He concludes the chapter by a warning against abuse of the practice of exorcism: "For such is the slyness of evil spirits that what they do of their own accord and what men do at their suggestion, they with great pains disguise so that they appear to perform it unwillingly. They pretend to be coerced and simulate to be drawn out as it were by the power of exorcisms, and that they may be the less guarded against they compose exorcisms apparently expressed in the name of God or in the faith of the Trinity or in the power of the incarnation or passion; and they transmit the same to men and obey men who use these, until they finally involve them with themselves in the crime of sacrilege and penalty of damnation. Sometimes they even transform themselves into angels of light, they teach only things of good repute, forbid unlawful things, strive to imitate purity, make provision for needs, so that, as if good and favoring, they are received the more familiarly, are heard the more kindly, are loved the more closely, are the more readily obeyed. They also put on the guise of venerable persons. . . ."[1]

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[1] *Epistola* 297 (Migne, cols. 345-46).

Divination from polished surfaces.

"The *specularii,*" John continues, "flatter themselves that they immolate no victims, harm no one, often do good as when they detect thefts, purge the world of sorceries, and seek only useful or necessary truth.".[2] He insists that the success of their efforts is none the less due to demon aid. John tells how as a boy he was handed over for instruction in the Psalms to a priest who turned out to be a practitioner of this variety of magic, who after performing various adjurations and sorceries tried to have John and another boy look into polished basins or finger-nails smeared with holy oil or chrism and report what they saw. The other boy saw some ghostly shapes but John thanks God that he could see nothing and so was not employed henceforth in this manner. He adds that he has known many *specularii* and that they have all suffered loss of their sight or some other evil except the aforesaid priest and a deacon, and that they took refuge in monasteries and later suffered evils above their fellows in their respective congregations.

Natural science and medicine.

John closes his second book with a chapter on natural scientists and medical men, for he seems to apply the term *physici* in both senses, although towards the close of the chapter he also employs the word *medici.* He begins by saying that it is permissible to consult concerning the future anyone who has the spirit of prophecy or who from scientific training knows by natural signs what will happen in the bodies of animals, or who "has learned experimentally the nature of the time impending," provided only that these latter men say and do nothing prejudicial to the Christian

[1] II, 27; Webb, I, 155-56.

[2] II, 28.

faith. But sometimes the *physici* attribute too much to nature,[1] and John has heard many of them disputing concerning the soul and its virtues and operations, the increase and diminution of the body, the resurrection, and the creation, in a way far from accord with the Christian faith. "Of God Himself too they sometimes so speak, 'As if earth-born giants assailed the stars.'"[2] John recognizes, however, their knowledge of animals and medicine, although he finds their theories sometimes in conflict. As for practicing physicians, he dares not speak ill of them, for he too often falls into their hands, and he grants that no one is more necessary or useful than a good doctor. John makes considerable use of the *Natural History* of Pliny and of Solinus, and sometimes for occult or marvelous phenomena, as when he cites Pliny concerning men who have the power of fascination by voice and tongue or by their glances, and adds the testimony of the Physiognomists.[3]

Summary.

It may be well to review and further emphasize some of the chief features of John's rather rambling discussion. Despite its frequent quotations from classic poets and moralists, it is theological in tone and content to a degree perhaps greater than I have succeeded in suggesting, for to repeat all its scriptural passages would be tedious. There is even some theological jealousy and suspicion of natural science shown. John perhaps more nearly duplicates the attitude of Augustine than that of any other writer. Magic is represented as inevitably associated with, and the work of, demons. John sometimes charges the magic arts with being irrational or injurious, but these charges are in a way but corollaries of his main thesis. The arts must be harmful since demons are concerned with them, while the influence of demons seems the only rational explanation for their existence. John repeats the old Isidorian definition of magic but he adds some current superstitions and shows that the magic arts are far from having fallen into disuse. Finally he shows us how vain must have been all the ecclesiastical thunders and warnings of demons and damnation, like his own, directed against magic, from the fact that not merely kings of the past like Saul and Pharaoh, but clergy of the present themselves—a priest and a deacon, a chancellor and an archbishop of England—practice or patronize such arts. Sometimes John's own condemnation of them seems a bit perfunctory; he takes more relish, it seems at times, in describing them. Again, as in the case of astrology, he evidently feels that his opposition will be of little avail.

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[1] II, 29 (Migne, col. 475). Licet tamen ut de futuris aliquis consulatur, ita quidem si aut spiritu polleat prophetiae, aut ex naturalibus signis quid in corporibus animalium eveniat physica docente cognovit, aut si qualitatem temporis imminentis experimentorum indiciis colligit. Dum tamen his posterioribus nequaquam quis ita aurem accommodet ut fidei aut religioni praejudicet. . . . At physici, dum naturae nimium auctoritatis attribuunt, in auctorem naturae adversando fidei plerumque impingunt.

[2] Webb, I, xxxiii and xxxv.

[3] V, 15 (Webb, I, 345).

CHAPTER XLII

DANIEL OF MORLEY AND ROGER OF HEREFORD: OR ASTROLOGY IN ENGLAND IN THE SECOND HALF OF THE TWELFTH CENTURY

Daniel's education—(Bibliographical note)—Defense of Arabian learning—A moderate treatment of moot points between science and religion—The four elements and fifth essence—Superiors and inferiors—Daniel's astronomy—Astrological argument—Astrology and other sciences—Daniel and Greek: a misinterpretation—Daniel and the church: a misinterpretation—Daniel's future influence—Roger of Hereford—An astrology in four parts—Another astrology in four parts—*Book of Three General Judgments*—Summary.

Daniel's education.

IN discussing Gerard of Cremona in a previous chapter we noticed the studies at Toledo of Daniel *de Merlai* or of Morley, how he heard Gerard translate the *Almagest* into

In the following bibliographical note the MSS will be listed first and then the printed works by or concerning Daniel of Morley

Arundel 377, 13th century, well-written small quarto, fols. 88-103, "Philosophia magistri danielis de merlai ad iohannem Norwicensem episcopum. . . . / . . . Explicit liber de naturis inferiorum et superiorum." Until very recently this was supposed to be the only MS of Daniel's sole extant work. No other treatise has as yet been identified as his, but several other MSS may be noted of the whole or parts of the aforesaid "Philosophia" or "Liber de naturis inferiorum et superiorum."

Corpus Christi 95, 13th century, where, according to K. Sudhoff in the publication noted below, the first two or three books ascribed to William of Conches are really the work of Daniel of Morley.

Berlin Latin Quarto 387, 12th century, 51 fols. Attention was called to it by Birkenmajer in the publication noted below. It has many slips of copyists and is regarded by him as neither the original nor a direct copy thereof. For the MS to be written in the twelfth century this would require a very rapid multiplication and dissemination of Daniel's treatise which was at the earliest not composed until after 1175.

The remaining MSS have not hitherto been noted by writers on Daniel:

CUL 1935 (Kk. I. 1), 13th century, small folio, fols. 98r-105r (and not to 115r, as stated in the MSS catalogue, which gives Daniel Morley as the author, but *De creatione mundi* as the title). From rotographs of fols. 98r-v, 100r, and 105r, I judge that this copy is almost identical with Arundel 377 but somewhat less legible and accurate.

Oriel 7, 14th century folio, fols.

Latin and defend the fatal influence of the stars, and Galippus, the Mozarab, teach concerning the universe in "the tongue of Toledo,"—presumably Spanish. Like Adelard of Bath, Daniel had long absented himself from England in the pursuit of learning, and had first spent some time at Paris, apparently engaged in the study of Roman law. He became disgusted, however, with the instruction

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194v-196v (191-193, according to Coxe), extracts from *De philosophia Danielis,* opening, "Nos qui mistice." . . . They are immediately preceded by extracts from "Adelardi Bathoniensis . . . de decisionibus naturalibus."

Corpus Christi 263, early 17th century, fols. 166v-67r, "Ex Daniele de Merlai (or, "Merlac," according to Coxe) "alias Morlêy in lib. de superioribus et inferioribus primo De creationis Mundi." This MS is one of the notebooks of Brian Twyne, the Elizabethan antiquary, written in his own hand.

Twyne perhaps made his extracts from Arundel 377, for immediately after them he gives extracts "from William of Conches who is together with Daniel Merlai in our library," and in Arundel 377 Daniel's work is immediately followed by that of William of Conches. Moreover, of the Selden MSS which are now in the Bodleian, Supra 72 was once owned by Lord "William Howarde" who died in 1640, while Supra 77 is marked "Arundel," referring presumably to Thomas Howard, Earl of Arundel, who died in 1646, and Supra 79 consists of astronomical and astrological treatises copied by Brian Twyne. If MSS which once belonged to the Arundel collection and to Twyne have thus passed somehow into the Selden collection and are found listed there in close proximity to one another, it is at least tempting to conjecture that the MS containing Daniel's treatise, followed by that of William of Conches, which Twyne says was once "in our library," somehow became Arundel 377.

BN 6415 does not contain *De philosophia Danielis,* as stated by C. Jourdain (1838) p. 101; Jourdain, however, regarded Adelard of Bath as the author of *De philosophia Danielis,* and BN 6415 does contain Adelard's *Questiones naturales.*

Balliol 96, 15th century, a commentary upon Aristotle's eight books of Physics in the form of questions and preceded by a prologue, "Expliciunt questiones super 8 libros phisicorum compilate a domino Marlo magistro in artibus Tholose ac canonico de Timsey." This does not seem to be a work by Daniel of Morley; a cursory examination revealed no reason for thinking that *domino Marlo* should read *Daniele Merlai,* or that *Tholose* should be *Tholeto.*

I have not examined two MSS at King's College, Cambridge, Reg. lxxi; lxxiv, 4) containing pedigrees of the Morlay or Morley family which may possibly throw some light upon Daniel's identity.

All the printing that has been done of Daniel's treatise has been based upon Arundel 377. J. O. Halliwell, *Rara Mathematica,* 1839, and Thomas Wright, *Biographia Literaria,* London, 1846, II, 227-30, printed the preface and other brief extracts for the first time.

Valentin Rose reprinted the preface and also published the conclusion in his article, "Ptolemaeus und die Schule von Toledo," *Hermes* VIII (1874) 327-49. Rose also gave a list of the authorities cited by Daniel which there and in his preface [1] speaks sarcastically of "the brutes" (*bestiales*) who occupied professorial chairs "with grave authority" and read from codices too heavy to carry (*importabiles*) which reproduced in golden letters the traditions of Ulpian. Holding lead pencils in their hands, they marked these volumes reverently with oboli and asterisks. They wished to conceal their ignorance by maintaining a dignified and statuesque silence, "but when they tried to say something, I found them most childish." Daniel accordingly made haste away to Spain to acquire the learning of the Arabs and to hear "wiser philosophers of the universe." Finally, however, his friends summoned him back to Eng-

makes a very large number of omissions: for example, fol. 89r, "sicut in trismegisto repperitur" and "isidori"; fol. 90v, Aristotle, "philosophus," "Adultimus" (?), "Platonitus"; fol. 91r, "Esiodus autem naturalis scientie professor omnia dixit esse ex terra," and so on for "tales milesius," Democritus, and other Greek philosophers; fol. 91v, "sicut ab inexpugnabili sententia magni hermetis"; fol. 92r, "audiat ysidori in libro differentiarum"; fol. 92v, "unde astrologus ille poeta de creatione mundi ait," and "magnus mercurius" and "trismegistus mercurius" and "trismegistus mercurius praedicti mercurii nepos"; fol. 97r, "Aristotelis in libro de sensu et sensato," "Albumaxar," "Aristotelis in libro de auditu naturali"; fol. 98v, "in libro de celi et mundo"; fol. 99v, Almagest, and "Ypocrati et galieno"; fol. 100v, "liber veneris . . . quem edidit thoz grecus," and "aristoteles . . . in libro de speculo adurenti."

Karl Sudhoff, *Daniels von Morley Liber de naturis inferiorum et superiorum nach der Handschrift Cod. Arundel 377 des Britischen Museums zum Abdruck gebracht,* in *Archiv für die Geschichte der Naturwissenschaften und der Technik,* Band 8, 1917 (but not received at the New York Public Library until July 8, 1921). Here is printed for the first time the full text of Daniel's treatise as contained in Arundel 377, but from photographs taken years before and apparently without further reference to the MS itself. Also according to the following article by Birkenmajer, Sudhoff sometimes renders the contractions and abbreviations incorrectly. As Sudhoff's text comes late to my hand, I leave my references to the folios of Arundel 377 as they are. These folios (with the exception of 88v) are marked in Sudhoff's text.

Alexander Birkenmajer, *Eine neue Handschrift des Liber de naturis inferiorum et superiorum des Daniel von Merlai,* in the same *Archiv,* December, 1920, pp. 45-51, gives some variant readings from Berlin 387.

Dr. Charles Singer has published a brief account of Daniel of Morley in a recent issue of *Isis.*

The article on Daniel in DNB XXXIX (1894) by A. F. Pollard is criticized by Sudhoff for failing to mention "Roses wichtigste Vorarbeit;" but I observe that Sudhoff himself similarly fails to mention the publications by Halliwell and Thomas Wright which preceded both Rose's and his own.

[1] Fol. 88r.

land and he returned "with an abundant supply of precious volumes." On his arrival he found that the interest in Roman law had almost completely eclipsed that in Greek philosophy, and that Aristotle and Plato were assigned to oblivion. Not wishing to remain the sole Greek among Romans, he prepared to withdraw again where the studies in which he was interested flourished. But on the way he met John, bishop of Norwich (1175-1200) who asked him many questions concerning his studies at Toledo and the marvels of that city, and concerning astronomy and the rule of the superior bodies over this sublunar world. Daniel's present treatise gives a fuller reply to these inquiries than time then permitted him to make.

Defense of Arabian learning.

Daniel warns his readers at the start not to scorn the simple language and lucid style in which the doctrines of the Arabs are set forth, or to mistake the laborious circumlocutions and ambiguous obscurities of contemporary Latins for signs of profound learning. Nor should anyone be alarmed because he presents the opinions of Gentile philosophers instead of church fathers in treating of the creation of the world. They may not have been Christians, but where their opinions seem sound, Daniel believes in taking spoils of learning even from pagans and infidels, as God instructed the Hebrews to do in the case of the golden and silver vessels of the Egyptians. Thus he borrows the theory of a triple universe from an Arabic work. The first universe exists only in the divine mind and is neither visible nor corporeal, but is eternal. The second universe is in work and is visible, corporeal, and in that state not eternal. It was created simultaneously with time. The third universe is imitative. It is the microcosm and was formed in time and is visible and corporeal, but is in part eternal.[1] In a later passage [2] Daniel again defends his use of Arabian authorities, contending that it is only just that one who is already informed concerning the opinions about things supercelestial of the philosophers in use among the Latins should also not disdain to listen attentively to the views of the Arabs which cannot be impugned. It may be perilous to imitate them in some respects, but one should be informed even on such points in order to be able to refute and avoid the errors to which they lead.

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[1] Fols. 88v-89r.

[2] Fol. 95v.

A moderate treatment of moot points between science and religion.

In general plan, tone, and content, as well as in the title, *Philosophia*, Daniel's treatise roughly resembles that of William of Conches. As Daniel says in his preface, the first part deals with the inferior portion of the universe, and the second part with the superior part. The work proper opens with a discussion of the creation, in which Daniel expresses some rather original ideas, although he treats of such time-worn topics as God's creation of the angels, of the universe, and of man in His own image, and then of man's fall through concupiscence, virtue and vice, and like matters. Later he argues against those who hold that the world is eternal, but he is not quite ready to accept the Mosaic account of creation entire. He argues that in the beginning God created heaven and earth and cites Augustine, Isidore, and Bede to show that the meaning is that heaven and earth were created simultaneously. He then adds that philosophers are loath to accept the division of the works of creation over six days; in human works it is true that one thing must be done before another, but God could dispense everything with "one eternal word." [1]

The four elements and fifth essence.

The four elements are discussed a good deal and it is explained that fire is hot and dry, air is hot and wet, and so on.[2] To fire correspond cholera, the light of the eyes, and curiosity; to air, blood, words, and loquacity; to water, phlegm, abundance of natural humors, and lust; to earth, melancholy, corpulence, and cruelty.[3] Daniel, like Adelard of Bath and William of Conches, repeats the doctrine that the four elements are not found in a pure state in any bodies perceptible to our sense, that no one has ever touched earth or water, or seen pure air or fire, and that the four elements are perceptible only to the intellect. Daniel differs from Adelard and William, however, in denying that the stars are made merely out of the purer parts of the four elements. He declares that the Arabs will not agree to this, but that the higher authorities in astrology assert that the stars are composed of a fifth essence.[1] Daniel furthermore speaks of three bonds existing between the four elements, stating that scientists call the relation between fire and air, obedience; that between air and water, harmony; and that between water and earth, necessity.[2] This faintly reminds one of the three relationships between the four principles of things which were associated with the names of the three fates in the essay on fate ascribed to Plutarch.

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[1] Fol. 96.

[2] Fol. 94v.

[3] Fol. 89v.

Superiors and inferiors.

But the greatest bond in nature is that existing between the superior and inferior worlds. An oft-repeated and fundamental principle of Daniel's philosophy, and one which explains the division of his work into two parts, is the doctrine that superiors conquer inferiors, that the world of the sky controls the world of the four elements, and that the science of the stars is superior to all other disciplines.[3] "The sages of this world have divided the world into two parts, of which the superior one which extends from the circle of the moon even to the immovable heaven is the agent. The other, from the lunar globe downwards, is the patient."[4] Much depends, however, not only upon the force emitted by the agent but upon the readiness of the patient to receive the celestial influence.

Daniel's astronomy.

Daniel of course believed in a spherical earth and a geocentric universe. Influenced probably by the *Almagest,* he explains the eccentrics of the five planets in a way which he regards as superior to what he calls the errors of Martianus Capella and almost all Latins, and to the obscure traditions which the Arabs have handed down but scarcely understood themselves.[5] He affirms that there are not ten heavens or spheres, as some have said, but only eight, as Alphraganus truly teaches.[1]

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[1] Fol. 95v.

[2] Fol. 93v.

[3] Fols. 95r-96.

[4] Fol. 92r.

[5] Fol. 101v.

Astrological argument.

There are some men who deny any efficacy to the motions of the stars, but Daniel charges that they for the most part condemn the science without knowing anything about it, "and hold astronomy in hatred from its name alone."[2] He replies that it is useful to foreknow the future and defends astrology in much the usual manner. He details the qualities of the seven planets[3] whom the Arabs call "lords of nativities."[4] Also he takes up the properties and attributes of the signs of the zodiac and how the Arabs divide the parts of the human body among them.[5]

Astrology and other sciences.

Daniel interprets the scope of astrology very broadly, asserting that it has eight parts: the science of judgments, or what we should call judicial astrology; medicine; nigromancy according to physics; agriculture; illusions or magic (*de praestigiis*); alchemy, "which is the science of the transmutation of metals into other species; the science of images, which Thoz Grecus set forth in the great and universal book of Venus; and the science of mirrors, which is of broader scope and aim than the rest, as Aristotle shows in the treatise on the burning glass."[6] Except that magic illusions have replaced navigation, this list of eight branches of learning is the same as that which Gundissalinus repeated from Al-Farabi, but which they called branches of natural science rather than of astrology. At any rate we see again the close association of natural science and useful arts with astrology and magic, and necromancy and alchemy, and with pseudo-writings of Aristotle and Hermes Trismegistus. In other passages Daniel cites genuine Aristotelian treatises[7] and speaks of "the great Mercury" and of the other "Mercury

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[1] Fol. 100v.

[2] *Idem.*

[3] Fol. 99v.

[4] Fol. 102v.

[5] Fol. 102r.

[6] Fol. 100v.

[7] *De sensu et sensato* at fols. 97r and 98v; *De coelo et mundo, ibid.; De auditu naturali,* fol. 97r. I do not know if Al-Farabi's *De ortu scientiarum* is meant by (fol. 96r) "Aristotiles in libro de assignanda ratione unde orte sunt scientie."

Trismegistus, the nephew of the aforesaid."[1] Despite his subordination of alchemy to astrology in the above passage, Daniel does not seem to have it in mind when he remarks that there are "some who assign diverse colors of metals to the planets," as lead to Saturn, silver to Jupiter, white to Venus, and black to Mercury.[2] He goes on to deny that the stars are really colored any more than the sky is.

Daniel and Greek: a misinterpretation.

Some modern scholars have drawn inferences from Daniel's treatise with which I am unable to agree. Mr. S. A. Hirsch in his edition of Roger Bacon's Greek Grammar follows Cardinal Gasquet[3] in observing concerning Daniel's preface, "There can be no clearer testimony than this to the complete oblivion into which Greek had in those days fallen in western Europe, including England." It may be granted that there was and had been little knowledge of Greek grammar and the Greek language in twelfth century England, but that is not what Daniel is talking about: indeed, there seems to be no reason for believing Daniel himself proficient in either Greek grammar or Greek literature, although he was shrewd enough to question whether Chalcidius always interpreted Plato aright.[4] When he calls himself "the only Greek among Romans," he means the only one interested in Greek philosophy and astronomy and in translations of the same made largely from the Arabic. But earlier in the same century we have seen Adelard of Bath, William of Conches, and Bernard Silvester interested either in Platonism or Arabic science, and the anonymous Sicilian translator of the Almagest from the Greek, and before him Burgundio of Pisa and other translators from the Greek. Therefore all that Daniel's remarks seems to indicate is that there was less interest in Greek philosophy in England after his return than before he went away, owing to the temporary popularity of the study of Roman law. But he knew where the studies in which he was interested still flourished.

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[1] Fols. 92v, 91v, and 89r.

[2] Fol. 99r.

[3] Edmund Nolan and S. A. Hirsch, *The Greek Grammar of Roger Bacon,* Cambridge, 1902, p. xlvii. Gasquet, "English Scholarship in the Thirteenth Century," and "English Biblical Criticism in the Thirteenth Century," in *The Dublin Review* (1898), vol. 123, pp. 7 and 362.

[4] Fol. 89v, "Calcidius, forte minus provide exponens Platonem, dixit. . . ." We have so often been assured that the Middle Ages knew Plato only through Chalcidius' translation of the *Timaeus* that I think it advisable to note this bit of evidence that the medievals did not swallow their Chalcidius whole.

Daniel and the church: a misinterpretation.

A more serious misinterpretation of Daniel's relation to his age is Valentin Rose's assertion that, because of Daniel's addiction to Arabian and astrological doctrines, "his book found no favor in the eyes of the church and was shunned like poison. It has left no traces in subsequent literature; no one has read it and no one cites it." [1] Rose spoke on the assumption that only one copy of Daniel's treatise had reached us, whereas now we know of several manuscripts of it. If it did not become so widely known as some works, the more probable reason for this may well be that his brief résumé of Arabic and astrological doctrines appeared too late, when the fuller works of Ptolemy and of the Arabic astrologers were already becoming known through complete Latin translations. Brief pioneer treatises, like those of Adelard of Bath and William of Conches, which had appeared earlier in the century, had had time to become widely known during a period when there was perhaps nothing fuller and better available. But Daniel's little trickle of learning from Toledo, which does not represent any very considerable advance over Adelard and William, might well be engulfed in the great stream of translations that now poured from Spain into Christian western Europe.[2] It is unreasonable to conjecture that Daniel's book, which is rather mild anyway in its astrological doctrine, and which was called forth by the favoring questions of a bishop, was then crushed by bitter ecclesiastical opposition; when we know that William's book, which actually encountered an ecclesiastical opposition of which we have no evidence in Daniel's case, nevertheless continued in circulation and was much cited in the next century; and when we know that both Arabic and astrological doctrines and books were widespread in Christian western Europe both in the twelfth and thirteenth centuries. Treatises with more poison of astrology in them than his were read and cited and seem to have weathered successfully, if not to have escaped unscathed, whatever ecclesiastical censure may have been directed against them. If Daniel's own composition did not secure a wide circle of readers, the chances are that "the multitude of precious volumes" which he imported from Spain to England did. And if the work of the pupil remained little cited, the translations of the master, Gerard of Cremona, who had taught him astrology at Toledo, became known throughout western Europe. Thus, while Daniel's personal influence may not have been vast, he reflects for us the progress of a great movement of which he was but a part.

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[1] Rose (1874), p. 331. Sudhoff (1917), p. 4, although himself calling attention to a second manuscript of Daniel's treatise, continues to hold that it "scheint wenig Verbreitung gefunden zu haben."

[2] Sudhoff (1917), p. 4, expresses a similar opinion. He still, however, repeats with respect Rose's assertion that the treatise "wie ein Gift beseitigt worden," but would explain this as less due to Daniel's astrological doctrine than his employing Arabian authorities instead of the church fathers.

Daniel's future influence.

But Rose was further mistaken in his assertion that Daniel's *De philosophia* "has left no trace in subsequent literature; no one has read it and no one cites it." Not only is the work found complete in three manuscripts of which Rose did not know, and of which one appears to be twice removed from the original. In a manuscript of the fourteenth century at Oriel College, Oxford,[1] in the fitting company of excerpts from Adelard of Bath and Gundissalinus, are over three double column folio pages of extracts drawn from various portions of the *Philosophia*. These begin with Daniel's excuse for borrowing the eloquence and wisdom of the infidels and with some of his utterances anent the creation of the world. They include a number of his citations of other writers, his story of the two fountains outside the walls of Toledo which varied in fulness with the moon's phases and contained salt water although remote six days journey from the sea, and other bits of his astrological doctrine. A similar, although not identical, selection of pearls from Daniel's philosophy is found in one of the notebooks of Brian Twyne,[1] the Elizabethan antiquary, who gives the title of Daniel's work as *De superioribus et inferioribus* and makes extracts both from its first and second books. Both Twyne and the Oriel manuscript's writer seem to have been particularly impressed with Daniel's views concerning the creation, rather than his retailing of astrological doctrine. Twyne first repeats his statement that the quantity of the universe reveals the power of its Maker; its quality, His wisdom; and its marvelous beauty, His unbounded good will. Twyne also notes Daniel's phrase, "court of the world," for the universe. Both Twyne and the Oriel manuscript note the passage concerning the triple universe, and another in which Daniel tells how the three human qualities, reason, irascibility, and desire, may be either used to discern and resist evil, or perverted to evil courses. Both also notice his contention that the chaos preceding creation was not *hyle* or matter but a certain contrariety present in matter.

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[1] Oriel 7, fols. 194v-96v: see bibliographical note at beginning of this chapter for a fuller description of it and the following MS of Brian Twyne.

Roger of Hereford.

In the same manuscript with Daniel's treatise is a work by another Englishman, Roger of Hereford,[2] who was contemporary with him, who wrote treatises both in astronomy and astrology, and who, again like Daniel, was encouraged by a bishop. We are not, I believe, directly informed whether any of his works were translations from the Arabic or whether he was ever in Spain, but some of them sound as if they might be at least adaptations from the Arabic. At any rate Alfred of England dedicated to Roger the translation which he made from the Arabic of the pseudo-Aristotelian *De vegetabilibus*. Astronomical tables which Roger calculated for the meridian of Hereford in 1178 are based upon tables for Marseilles and Toledo, and the manuscript of one of his works is said by the copyist of 1476 to have been taken by him from an ancient codex written in Toledo in the year 1247.[1] Other astronomical treatises attributed to Roger are a *Theory of the Planets,* a *Treatise concerning the rising and setting of the Signs,* and a *Compotus* which dates itself in 1176 and is addressed to a Gilbert [2] who seems to be no other than Foliot, bishop of Hereford until 1163 and thereafter bishop of London. The signature of Roger of Hereford attests one of his documents in 1173-1174. In 1176 in the preface to the *Compotus* [3] Roger speaks of himself as *iuvenis,* and the heading in the manuscript even calls him "Child Roger" or "Roger Child," [4] but he also says that he has devoted many years to learning, so that we need not regard him as especially youthful at that time. The definite dates in his career seem to fall in the decade from 1170 to 1180, although his association with Alfred of England may well have been later.

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[1] Corpus Christi 263, fols. 166-7.

[2] Professor Haskins' account of Roger's life and works in his "Introduction of Arabic Science into England," EHR (1915), XXX, 65-8, supplements and supersedes the article in DNB. Where I do not cite authorities for statements that follow in the text, they may be found in Haskins' article.

An astrology in four parts.

Professor Haskins ascribes one or more astrological works to Roger of Hereford and lists a number of manuscripts with three different *Incipits.*[5] Some of these manuscripts I have examined. One at Paris has the *Titulus,* "In the name of God the pious and merciful, here opens the book of the division of astronomy and its four parts composed by the famous astrologer Roger of Hereford." [6]

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[1] BN 10271, fol. 203v, quoted by Haskins (1915), p. 67. It seems to me, however, from an examination of the MS that Roger's work concludes at fol. 201v, "Explicit liber," and that this extract, "Ad habendam noticiam quis est vel erit dominus anni," at fol. 203v, may be another matter.

[2] The initial letters of the table of contents form the acrostic, "Gilleberto Rogerus salutes H. D."

[3] Printed in part by T. Wright, *Biograph, Lit.,* p. 90 *et seq.*

[4] Digby 40, fol. 65, "Prefatio magistri Rogeri Infantis in compotum"; Haskins conjectures that *Infantis* may be a corruption for Hereford, or an equivalent for the *iuvenis* of the text; but Leland took it as Roger's surname and called him Roger Yonge.

[5] Haskins is not quite accurate in saying (p. 67), "Royal MS 12 F, 17 of the British Museum, catalogued as 'Herefordensis iudicia' is really the treatise of Haly, *De iudiciis,*" for while the MS does contain Egidius de Tebaldis' translation of *Haly de iudiciis* in a fourteenth century hand, on its fly-leaves are inserted in a fifteenth century hand both "iudicia Herfordensis" and a treatise on conjunctions of John Eschenden. Moreover, all these items are listed both in the old and the new catalogue of the Royal MSS.

[6] BN 10271, written in 1476, 1481 A. D., etc., fol. 179-, "In nomine dei pii et misericordis Incipit liber de divisione astronomie atque

Roger explains that the first part is general and concerned with such matters as "peoples, events, and states, changes of weather, famine, and mortality." The second is special and deals with the fate of the individual from birth to life's close. The third deals with interrogations and the fourth with elections. The first chapter of the first part is entitled, "Of the properties of the signs and planets in any country," and opens with the statement that it has been proved by experience that the signs Aries and Jupiter have dominion in the land "baldac and babel and herach," Libra and Saturn in the land of the Christians, Scorpion and Venus in the land of the Arabs, Capricorn and Mercury in India, Leo and Mars over the Turks, Aquarius and the Sun in Babylonia, Virgo and the Moon in Spain. The other five signs seem to be left without a country.[1] Chapter two tells how to find what sign dominates in any villa; three, of the powers of the planets in universal events; four, of the science of the annual significance of the planets; five, knowledge of rains for the four seasons; six, knowledge of winds in any villa;[2] nine, the twenty-eight mansions of the moon. After the tenth chapter distinguishing these mansions as dry and wet and temperate, the second part on nativities opens with the retrospective statement, "Now we have treated of the first part of this art, omitting what many astrologers have said

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de eius quatuor partibus compositus per clarum Rogerium Herfort Astrologum." The text proper opens: "Quoniam principium huic arti dignum duximus de quatuor eius partibus agamus."

[1] This chapter is almost exactly like the first chapter of the first book of the printed edition of John of Spain's *Epitome totius astrologiae,* and the general plan of the two treatises and their emphasis upon experience are very similar, although there also seem to be considerable divergences. For instance, the next chapter in the printed text is different, "De coniunctionibus planetarum, quae sunt numero c.xx." Unfortunately I have not been able to compare edition and manuscript in detail. Both may represent texts of late date which have rearranged or added variously to the original, whether it be by John or Roger. Or both John and Roger may have taken similar liberties with a common Arabic source. John's authorship appears to be supported by more MSS than Roger's.

[2] Caps. 7 and 8, at fol. 182r-v, are, "De proprietate signorum in qualibet terra" and "De cognitione de bono anno vel malo."

without experience and without reason."[1] After a dozen chapters on the significance of the twelve houses in nativities, the author again asserts that in his discussion of that subject he has said nothing except what learned men agree upon and experience has tested.[2] After devoting three chapters to the familiar astrological theme of the revolution of years, he takes up in the third and fourth books[3] interrogations according to the twelve houses and elections, which are made in two ways according as the nativity is or is not known. The invocation of God the pious and compassionate in the *Titulus* and the list of countries and peoples in the first chapter have a Mohammedan and oriental flavor and suggest that the work is a translation.

Another astrology in four parts.

Different from the foregoing is another work dealing with four parts of judicial astrology which the manuscripts ascribe to Roger of Hereford. Its opening words[4] and the subjects of its four parts all differ from those of the other treatise. Its first part deals with "simple judgment"; its fourth part, with "the reason of judgment"; while its second and third parts instead of third and fourth, as in the foregoing treatise, deal with interrogations, now called *Cogitatio,* and elections.[5] I know of no manuscript where this second work is to be found complete; in fact, I am inclined to surmise that usually the manuscripts give only the first of its four parts.[6] It professes at the start to be a

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[1] Fol. 183v, "Iam egimus de prima parte huius arte omissis que astrologi multi sine experimento et ratione dixerunt."

[2] Fol. 190v (cap. 14, de revolutione annorum nativitatis), "Iam radicem nativitatis sermone complevimus nec diximus nisi in quibus sapientes convenerunt et experimentum ex ipsis habetur." The same sentence occurs in John of Spain, *Epitome totius astrologiae,* 1548, II, xx, fol. 62v.

[3] Book 3, fols. 192v-199r, has 16 chapters; Book 4, fols. 199v-201v, has ten. The division into chapters is different in the printed text ascribed to John of Spain.

[4] Berlin 964, 15th century, fol. 87-, "Quoniam regulas artis astronomie iudicandi non nisi per diversa opera dispersas invenimus universali astrologorum desiderio satisfacere cupientes. . . ." Other MSS similar.

[5] Selden supra 76, fol. 3v, de simplici iudicio, de cogitatione, de electione, de ratione iudicii.

[6] Digby 149, 13th century, fols. 189-95, "Liber de quatuor partibus astronomie iudiciorum editus a magistro Rogero de Herefordia. Quoniam regulas astronomie artis . . . / . . . Explicit prima pars."

CUL 1693, 14th century, fols. 40-51, "Liber Magistri Rogeri de brief collection of rules of judicial astrology hitherto only to be found scattered through various works. Astrology is extolled as an art of incomparable excellence without which other branches of learning are fruitless. "They appear to a few through experiments; . . . it gives most certain experiments." [1] The first book treats of the properties of the signs and planets, of the twelve houses, and defines a long list of astrological terms such as *respectus, applicatio, separatio, periclitus, solitudo, allevatio, translatio, collatio, redditio, contradictio, impeditio, evasio, interruptio, compassio, renuntiatio,* and *receptio.*[2] Some tables are also given, in connection with one of which we are told that the longest hour at Hereford excedes the shortest by eleven degrees and forty minutes.[3]

Book of Three General Judgments.

To Roger is also ascribed a *Book of Three General Judgments of Astronomy, from which all others flow,* which sometimes is listed separately in the manuscripts and apparently is found alone as a distinct work,[4] but in other manuscripts [5] seems to be an integral part of the work of four parts which we have just described. Its three general judgments are: gaining honors and escaping evils; *intentio vel meditacio,* which, like the *cogitacio* mentioned above, refers

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Herfordia de iudiciis Astronomie. Quoniam Regulas artis Astronomice . . . / . . . oportet inspicere diligenter et completur Liber primus."

I shall presently show reason for thinking that Selden supra 76 and MS E Musaeo 181 also give only the first part.

[1] Selden supra 76, fol. 3r.

[2] Selden supra 76, fol. 6, has only those terms from *redditio* on; the others will be found in MS E Musaeo 181.

[3] Selden supra 76, fol. 5r.

[4] BN 7434, 14th century, #5, de tribus generalibus iudiciis astronomie ex quibus certa (cetera?) defluunt. . . .

Dijon 1045 (the same, I judge, as that numbered 270 by Haskins), 15th century, fol. 172v-, "Quoniam circa tria fit omnis astronomica consideratio . . . / . . . sed non respiciens 3. Explicit."

In the following MS it follows the first book of the work in four parts but is listed as distinct therefrom in the catalogue:

CUL 1693, 14th century, fols. 51-59, "Liber de tribus generalibus iudiciis astronomie ex quibus cetera omnia defluunt editus a Magistro Rogero de Herfordia. Quoniam circa tria sit (fit?) omnis astronomica consideratio . . . / . . . minimus vero septem horarum et 20 minutorum etc." This last is not the same ending as in Dijon 1045, but would seem to refer to the length of the shortest day.

[5] Selden supra 76 and MS E Musaeo 181.

to interrogations; and *comparatio vel electio* which of course is elections. Thus the second and third parts of this *Book of Three General Judgments* deal with the same subjects as the second and third books of the work in four parts, which makes it difficult to distinguish them. I am inclined to think that in those manuscripts where the *Book of Three General Judgments* seems an integral part of the work in four parts, we really have simply the first of the four parts, followed by the *Book of Three General Judgments.*[1] At any rate it seems clear that most of Roger's astrological composition is on the theme of interrogations and elections. *Iudicia Herefordensis,*[2] found in more than one manuscript, may come from a fourth work of his or be portions of the foregoing works.

Summary.

In this chapter we have treated of two Englishmen of the latter half of the twelfth century who are not generally known.[3] They were not, however, without influence, as we have already shown in the case of Daniel of Morley and as the number of manuscripts of the works of Roger of Hereford sufficiently attests for him. Daniel and Roger show that the same interest in astrology and astronomy from Arabic sources prevails at the close of the century in England as at its beginning in the cases of Walcher, prior of Malvern, and Adelard of Bath. Daniel, like Adelard, illustrates the relation of science to Christian thought; Roger, like Walcher, is an astronomer who makes and carefully records observations of his own,[1] while he trusts in astrology as based upon experience. As Alfred of England dedicated his translation of the pseudo-Aristotelian *De vegetabilibus* to Roger, so he dedicated his *De motu cordis* (*On the Motion of the Heart*) to a third Englishman, Alexander Neckam, to whom and his work *On the Natures of Things* (*De naturis rerum*) we turn in the next chapter for a picture of the state of science in his time.

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[1] As we have already seen to be the case in CUL 1693, fols. 40-51-59. In Selden supra 76, the work in four parts begins at fol. 3r, "Liber magistri Rogeri Hereford de iudiciis astronomicis. Quoniam regulas artis. . . ." At fol. 10v, Liber de tribus generalibus iudiciis astronomie ex quibus cetera omnia defluunt, editus a magistro Rogero Hereford. In three books and a prologue, opening, "Quoniam circa tria fit omnis astronomica consideracio. . . ." The question then arises, do fol. 14v, "Incipit liber secundus de cogitatione. Sed quum iam de intentione et cogitatione tractandum . . ."; and fol. 18r, "Incipit liber tercius de electione vel operatione per quod fiat electio"; have reference to the last two books of *Three General Judgments* or to the two middle books of the work in four parts? Apparently the former, since there is no fourth part given; at fol. 20 seems to open another treatise, *Liber de motibus planetarum.*

MS E Musaeo 181 has the same arrangement as Selden supra 76, fols. 10-18, but ends with the second book *De cogitacione.* For the first of the four parts it is fuller than Selden supra 76, fols. 3-9.

Laud. Misc. 594, fols. 136-137r, beginning mutilated, opens "illius signi et duodenarie ostendentis" and ends "secunda si vero respiciens tertia. Explicit liber de quatuor partibus iudiciorum astronomiae editus a magistro Rogero de Hereford." But the closing words, "respiciens tertia," are those connected with the Incipit of the *Book of Three General Judgments* in Dijon 1045, a good illustration of the complexities of the problem.

[2] Besides the fly-leaf of Royal 12-F-17, mentioned above in a note, Ashmole 192, #2, pp. 1-17, "Expliciunt iudicia Herfordensis multum bona et utilia." It will be noted that in Selden supra 76 the title *De iudiciis* is applied to to the work in four parts.

[3] Neither name, for example, despite the devotion of both to astrology, appears in the index of T. O. Wedel's, *The Mediaeval*

Attitude toward Astrology particularly in England, Yale University Press, 1920.

[1] For example, in the same MS with Daniel of Morley's work, Arundel 377, fol. 86v, de altitudine Solis etc. apud Toletum et Herefordiam; *Ibid.,* "Anni collecti omnium planetarum compositi a magistro Rogero super annos domini ad mediam noctem Herefordie anno ab incarnatione domini mclxxviii post eclipsim que contigit Hereford eodem anno" (13 September).

CHAPTER XLIII

ALEXANDER NECKAM ON THE NATURES OF THINGS

Birth and childhood—Education—The state of learning in his time—Popular science and mechanical arts—His works—*De naturis rerum*—Neckam's citations—His knowledge of Aristotle—Use of recent authors—Contemporary opinion of Neckam—His attitude toward natural science—Science and the Bible—His own knowledge of science—Incredible stories of animals—A chapter on the cock—Effect of sin upon nature—Neckam on occult virtues—Fascination—His limited belief in astrology—Neckam's farewell.

Birth and childhood.

In the year 1157 an Englishwoman was nursing two babies. One was a foster child; the other, her own son. During the next fifty years these two boys were to become prominent in different fields. The fame of the one was to be unsurpassed on the battlefield and in the world of popular music and poetry. He was to become king of England, lord of half of France, foremost of knights and crusaders, and the idol of the troubadours. He was Richard, Cœur de Lion. The other, in different fields and a humbler fashion, was none the less also to attain prominence; he was to be clerk and monk instead of king and crusader, and to win fame in the domain of Latin learning rather than Provençal literature. This was Alexander Neckam. Of his happy childhood at St. Albans he tells us himself in Latin verse somewhat suggestive of Gray's lines on Eton:

Hic locus aetatis nostrae primordia novit
Annos felices laetitiaeque dies
Hic locus ingenuis pueriles imbuit annos
Artibus et nostrae laudis origio fuit.

Education.

A number of years of his life were spent as teacher at Dunstable in a school under the control of the monastery of St. Albans. It was at Paris, however, that he received his higher education and also taught for a while. Scarcely any place, he wrote late in life, was better known to him than the city in whose schools he had been "a small pillar" and where he "faithfully learned and taught the arts, then turned to the study of Holy Writ, heard lectures in Canon Law, and upon Hippocrates and Galen, and did not find Civil Law distasteful." This passage not only illustrates his own broad education in the liberal arts, the two laws, medicine, and theology, but also suggests that these four faculties were already formed or forming at Paris. Neckam visited Italy, as his humorous poem bidding Rome good-by attests, and from two of the stories which he tells in *The Natures of Things*[1] we may infer that he had been in Rouen and Meaux. In 1213 Neckam was elected abbot of Cirencester, and died in 1217. An amusing story is told in connection with Neckam's first becoming a monk. He is said to have first applied for admission to a Benedictine monastery, but when the abbot made a bad pun upon his good name, saying, *Si bonus es, venias; si nequam, nequaquam* (If you are a good man you may come; if Neckam, by no means), he joined the Augustinians instead.[2]

The state of learning.

Neckam gives us a glimpse of the learned world of his time as well as of his own education. He thinks past times happy, when he recalls that "the greatest princes were diligent and industrious in aiding investigation of nature," and that it was then commonly said, "An illiterate king is a crowned ass."[3] But he is not ashamed of the schools of his own day. After speaking of the learning of Greece and Egypt in antiquity and stating that schools no longer flourish in those lands, he exclaims, "But what shall I say of

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[1] I, 37 and II, 158.

[2] For references to the sources for the above facts of Neckam's life see the first few pages of the preface to Thomas Wright's edition of the *De naturis rerum*, and the *De laudibus divinae sapientiae*, in *Rerum Britannicarum Medii Aevi Scriptores*, vol. 34, London, 1863. All references in this chapter, unless otherwise noted, will be to this volume, and to the book and chapter of the *De naturis rerum*.

[3] II, 21.

Salerno and Montpellier where the diligent skill of medical students, serving the public welfare, provides remedies to the whole world against bodily ills? Italy arrogates to itself proficiency in the civil law, but celestial scripture and the liberal arts prefer Paris to all other cities as their home. And in accord with Merlin's prophecy the wisdom now flourishes at Oxford which in his time was in process of transfer to Ireland."[1] Neckam's assertion that there were no schools in the Greece and Egypt of his day is interesting as implying the insignificance of Byzantine and Mohammedan learning in the second half of the twelfth century. He perhaps does not think of Constantinople as in "Greece," but in Egypt he must certainly include Cairo, where the mosque el-Azhar, devoted in 988 to educational purposes, "has been ever since one of the chief universities of Islam."[2] At any rate it is clear that to his mind the intellectual supremacy has now passed to western Europe.

Popular science and mechanical arts.

In his praises of learning Neckam is a little too inclined, like many other Latin writers, to speak slightingly of the *vulgus* or common crowd. In antiquity, he affirms, the liberal arts were the monopoly of free men; mechanical or adulterine arts were for the ignoble.[3] This does not mean, however, that his eyes are closed to the value of practical inventions, since both in *The Natures of Things* and his *De utensilibus* we find what are perhaps the earliest references to the mariner's compass[4] and to glass mirrors.[5] Indeed, he often entertains us with popular gossip and superstition, mentioning for the first time the belief in a man in the moon,[6] and telling such stories of daily life as that of the lonely sailor whose dog helped him reef the sails and manage the ropes of the boat in crossing the Channel,[7] or of the sea-fowl whose daily cry announced to the sheep in the tidal meadow that it was time to seek higher pasture, until one day its beak was caught by the shell of an oyster it tried to devour and the sheep were drowned for lack of warning.[1]

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[1] II, 174.

[2] S. Lane-Poole, *The Story of Cairo*, London, 1902, p. 124.

[3] II, 21.

[4] II, 98. Wright, *Volume of Vocabularies*, p. 96.

[5] II, 154, and Wright, Preface, p. l, note. Wright gives no authority for his further observation, "The employment of glass for mirrors was known to the ancients, but appears to have been entirely superseded by metal."

[6] I, 14.

[7] II, 20.

His works.

Neckam's writings were numerous, and, as might have been expected from his wide studies, in varied fields. They include grammatical treatises,[2] works on Ovid and classical mythology, commentaries upon the books of the Bible such as the Psalms and Song of Songs, and the writings of Aristotle, and other works of a literary, scientific, or theological character.[3] Most of them, however, if extant, are still in manuscript. Only a few have been printed; [4] among them is *The Natures of Things* which we shall presently consider.

Neckam is a good illustration of the humanistic movement in the twelfth century. He wrote Latin verse [5] as well as prose; took pains with and pride in his Latin style; and shows acquaintance with a large number of classical authors. He had some slight knowledge, at least, of Hebrew. He was especially addicted, according to Wright,[1] to those ingenious but philologically absurd derivations of words in which the *Etymologies* of Isidore of Seville had dealt, explaining, for example, the Latin word for corpse (*cadaver*) as compounded from the three roots seen in the words for flesh (*caro*), given (*data*), to worms (*vermibus*). Yet in one chapter of *The Natures of Things* Neckam attacks "the verbal cavils" and use of obsolete words in his time as "useless and frivolous," and asks if one cannot be a good jurist or physician or philosopher without all this linguistic and verbal display.[2] Wright, moreover, was also impressed by Neckam's interest in natural science, calling him "certainly one of the most remarkable English men of science in the twelfth century," [3] and noting that "he not infrequently displays a taste for experimental science." [4]

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[1] II, 36.

[2] Such as his "Corrogationes Promethei" found at Oxford in the following MSS: Laud. Misc. 112, 13th century, fols. 9-42; Merton College 254, 14th century; Bodleian (Bernard 4094) and 550 (Bernard 2300), middle of 13th century.

[3] HL XVIII (1835), 521 was mistaken in saying that the *De naturis rerum* is the only one of Neckam's works found in continental libraries, for see Evreux 72, 13th century. Alexandri Neckam opuscula, fol. 2. "Correctiones Promethei," fol. 26v, "super expositione quarundem dictionum singulorum librorum Bibliothece scilicit de significatione eorum et accentu." And there is a copy of his *De utensilibus* in BN 15171, fol. 176.

[4] The *De utensilibus* was also edited by Thomas Wright in 1857 in *A Volume of Vocabularies.* Professor Haskins has printed "A List of Text-books from the Close of the Twelfth Century" in *Harvard Studies in Classical Philology,* XX (1909), 90-94, which he argues is from a work by Neckam (Gonville and Caius College MS 385, pp. 7-61). In 1520 there was printed under the name of Albericus a work which is really by Neckam, as a MS at Oxford bears witness, Digby 221, 14th century, fol. 1. "Mithologie Alexandri Neckam et alio nomine Sintillarium appellatur"; Incipit, "Fuit vir in Egipto ditissimus nomine Syrophanes." In the same MS, fols. 34v-85, follows another work, "Alexander Nequam super Marcianum de nuptiis Mercurii et Philologie." See also in the Bodleian (Bernard 2019, #3, and 2581, #6) Scintillarium Poiseos in quo de diis gentium et nominibus deorum et philosophorum de eis opiniones ubi et de origine idolatriae.

[5] See M. Esposito, "On Some Unpublished Poems Attributed to Alexander Neckam," in *English Historical Review,* XXX (1915), 450-71. He prints several poems on wine, etc., and gives a bibliography of Neckam's works, five printed and eleven in MSS.

De naturis rerum.

The Natures of Things, however, is not primarily a scientific or philosophical dissertation, as Alexander is careful to explain in the preface, but a vehicle for moral instruction. Natural phenomena are described, but following each comes some moral application or spiritual allegory thereof. The spots on the moon, for instance, are explained by some as due to mountains and to depressions which the sun's light cannot reach, by others as due to the greater natural obscurity of portions of the moon. Neckam adds that they are for our instruction, showing how even the heavenly bodies were stained by the sin of our first parents, and reminding us that during this present life there will always be some blot upon holy church, but that when all the planets and stars shall stand as it were justified, our state too will become stable, and both the material moon and holy church will be spotless before the Lamb.[5] Neckam intends to admire God through His creatures and in so doing humbly to kiss as it were the feet of the Creator. Despite this religious tone and the moralizing, Wright regarded the work "as an interesting monument of the history of science in western Europe and especially in England during the latter half of the twelfth century,"[1] and as such we shall consider it. That it was written before 1200 is to be inferred from a quotation from it by a chronicler of John's reign.[2] It seems to have been the best known of Neckam's works. The brevity of *The Natures of Things,* which consists of but two books, if we omit the other three of its five books which consist of commentaries upon *Genesis* and *Ecclesiastes,* hardly allows us to call it an encyclopedia; but its title and arrangement by topics and chapters closely resemble the later works which are usually spoken of as medieval encyclopedias. Later in life Neckam wrote a poetical paraphrase of it with considerable changes, which is entitled *De laudibus divinae sapientiae.*

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[1] P. xiii.

[2] II, 174.

[3] P. ix.

[4] P. xii.

[5] I, 14.

Neckam's citations.

The citations of authorities in the *De naturis rerum* are of much interest. A number of references to the law books of Justinian show Neckam's knowledge of the Roman law,[3] and, as we should expect after hearing of his commentary upon Ovid's *Metamorphoses,* allusions to that work, the *Fasti,* and the *Ars amandi* are frequent. Claudian is once quoted for two solid pages and considerable use is made of other Latin poets such as Vergil, Lucan, Martial, and Juvenal. Neckam believed that the diligent investigator could find much that was useful in the inventions of the poets and that beneath their fables moral instruction sometimes lay hid.[4] Neckam quotes Plato, perhaps indirectly, and repeats in different words the fable of the crow and fox, as given in

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[1] Pp. xiv-xv.

[2] Wright (p. lxxvii) used four MSS of the 13th or very early 14th century. At Corpus Christi College, Oxford, there is a beautifully written twelfth century copy which he did not use, MS 45, folio, 186 fols., double columns. Comment. in Genesim et Ecclesiasten, sive de naturis rerum libri quinque; "Explicit tract. mag. Alex. Neckham super Ecclesiasten de naturis rerum." Although Wright used two MSS from the Royal Library, he fails to note a third, MS 3737 in the Harleian collection of the British Museum. It is of the 13th century according to the catalogue and contains this interesting inscription, "Hic est liber S. Albani quam qui abstulerit aut titulum deleverit anathema sit. Amen." (This book belongs to St. Albans. May he who steals it or destroys the title be anathema. Amen.)

[3] I, 75, II, 155, 173.

[4] II, 11; II, 107; II 12; II, 126.

Apuleius.[1] The church fathers are of course utilized—Augustine, Jerome, Gregory, Basil, and a more recent theologian like Anselm, archbishop of Canterbury; and familiarity is shown with the early medieval standard authorities, such as Boethius, Cassiodorus, Bede, and Isidore. Of writers who may be regarded as dealing more particularly with natural science there are mentioned Pliny and Solinus on animals—but he seems to use Pliny very little and Solinus a great deal, Macer and Dioscorides on the properties and effects of herbs,[2] while works in the domain of astronomy or astrology are attributed to Julius (perhaps really Firmicus) and Augustus Caesar as well as to Ptolemy.[3]

His knowledge of Aristotle.

But what is most impressive is the frequent citation from Euclid and Aristotle, especially the latter. Not only the logical treatises are cited, but also the *History of Animals*[4] and the *Liber Coeli et Mundi,* while allusion is also made to Aristotle's opinions concerning vision, motion, melancholy, waters, and various astronomical matters.[5] Such passages—as well as the fact that commentaries on Aristotle are ascribed to Neckam—suggest that Roger Bacon was mistaken in the much-quoted passage in which he states that the works of Aristotle on natural philosophy were first introduced to the medieval (Latin) learned world in Latin translations by Michael Scot about 1230. Neckam perhaps cites the *History of Animals* indirectly: at any rate he makes little use of it; but his numerous mentions of Aristotle's views on nature make it evident that "the truth of Aristotelian" doctrine is already known in the twelfth century. And he already regards "the most acute Aristotle" as the pre-eminent authority among all philosophers. After stating that "all philosophers generally seem to teach" that the planets move in a contrary direction to the firmament like flies walking on a rushing wheel, Neckam adds a number of objections to this view, and adds, "It therefore was the opinion of Aristotle, the most acute, that the planets moved only with the firmament." He then expresses his amazement that the other philosophers should have dared to oppose Aristotle, should have presumed to set their opinions against so great a philosopher. It is as if a peacock spread its spotted tail in rivalry with the starry sky, or as if owls and bats should vie with the eagle's unblinking eye in staring at the mid-day sun.[1]

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[1] In H. E. Butler's translation, Oxford, 1909, given as *Florida,* cap. 26; in the MSS and in Hildebrand's text, pars II, Lipsiae, 1842, included in the *prologus* to the *De Deo Socratis,* with which we may therefore infer that Neckam was acquainted. Indeed there is a twelfth century manuscript of the *De Deo Socratis* in the British Museum—Harleian 3969.

[2] II, 166.

[3] II, 12.

[4] II, 44. Narcos piscis est tantae virtutis, ut dicit Aristoteles. . . . II, 159. Ut docet Aristoteles, omnia mula sterilis est. While the substance of these two passages is found in Pliny's *Natural History,* he does not mention Aristotle in these connections nor use the Greek word "narcos." Moreover, Neckam seems to give credit as a rule to his immediate sources and not to copy their citations; as we have seen, he credited the fable of the fox and crow to Apuleius and not to Aesop to whom Apuleius credits it.

[5] II, 153. Sed Aristoteli magis credendum esse reor quam vulgo. I, 39. Dicit tamen Aristoteles quod nihil habet duos motus contrarios. I, 7. Aristoteles qui dicit, "Solos melancholicos ingeniosos esse." II, 1. Secundum veritatem doctrinae Aristotelicae omnes aquae sunt indifferentes secundum speciem. I, 9. Placuit itaque acutissimo Aristoteli planetas tantum cum firmamento moveri. Sed quid? Aristoteli audent sese opponere? . . . etc.

Use of recent author

That Neckam had some acquaintance with Arabic and Jewish writers is indicated by his citing Alfraganus and Isaac. Of Christian writers of the century before him Neckam quotes from Hildebert, and four times from Bernard

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[1] It would therefore seem that Professor Haskins (EHR, 30, 68) is scarcely justified in saying that "the natural philosophy and metaphysics of Aristotle" are "cited in part but not utilized by Alexander Neckam," especially since he states presently that "Neckam himself seems to have been acquainted with the *Metaphysics*, *De Anima*, and *De generatione et corruptione*" (*Ibid.*, 69, and "A List of Textbooks," *Harvard Studies*, XX (1909), 75-94). Professor Haskins, however, believes that the new Aristotle was by this time penetrating England, but gives the main credit for this to Alfredus Anglicus or Alfred of Sareshel, the author of the *De motu cordis*, and the translator of the Pseudo-Aristotelian *De vegetabilibus* and of an appendix to the *Meteorologica* consisting of three chapters *De congelatis*, also translated from the Arabic. Alfred was no isolated figure in English learning, since he dedicated the *De vegetabilibus* to Roger of Hereford and the *De motu cordis* to Neckam: ed. Baruch, Innsbruck, 1878; and see Baeumker, *Die Stellung des Alfred von Sareshel . . . in der Wissenschaft des beginnenden XIII Jahrts., München, Sitzber.* (1913), No. 9. On the whole it is probably safe to assume that his knowledge of Aristotle was soon at least, if not from the start, shared with others. Grabmann (1916), pp. 22-25, adds nothing new on the subject of Neckam's knowledge of Aristotle.

Silvester. He cites the *Pantegni* or *Tegni* of Constantinus Africanus more than once.[1] He does not mention Adelard of Bath by name but in discussing experiments with vacuums repeats the experiment of the water jar. In another chapter he states that, if the earth were perforated, an enormous weight of lead would fall only to the center. Neckam's chapter on "Why in the same earth plants grow of contrary effects" is similar to the third chapter of the *Natural Questions* of Adelard, and his chapter on "Why certain animals ruminate" is like Adelard's seventh in the same work.[2]

Contemporary opinion of Neckam.

Roger Bacon, whose estimates of his contemporaries have sometimes been accepted at too high a value, wrote of Neckam some fifty years after Alexander's death: "This Alexander wrote true and useful books on many subjects, but he cannot with justice be named as an authority." [3] Bacon himself, however, seems on at least one occasion to have used Neckam as an authority without naming him.[4] On the other hand, another Englishman of note in science, Alfred of Sarchel or Sareshel, dedicated his book on The Movement of the Heart (*De motu cordis*) to Neckam.

His attitude toward natural science.

Whatever Neckam's own scientific attainments may have been, there can be no doubt that he had a high regard for *scientia* and that he was not wanting in sympathetic appreciation of the scientific spirit. This fact shines out in the pages of the *De naturis rerum* amid its moral lessons and spiritual illustrations, its erroneous etymologies and popular anecdotes. "Science is acquired," he says in one passage, "at great expense, by frequent vigils, by great expenditure of time, by sedulous diligence of labor, by vehement application of mind." [5] But its acquisition abundantly justifies itself even in practical life and destructive war. "What craftiness of the foe is there that does not yield to the precise knowledge of those who have tracked down the elusive subtleties of things hidden in the very bosom of nature?"[1] He often cites these experts in natural science, whom he always seems to regard with respect as authorities.[2] Not that he believes that they have solved all problems. Some things forsooth are so hidden that it seems as if Nature is saying, "This is my secret, this is my secret!"[3] On the other hand, there are many natural phenomena too familiar through daily use and experience to need mention in books, since even those who do not read are acquainted with them. Neckam consequently will follow a middle course in selecting the contents of his volume.

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[1] I, 39; II, 11; I, 49; II, 129, 140, 157; II, 157 and 161.

[2] I, 19; I, 16; II, 57; II, 162.

[3] Fr. Rogeri Bacon, *Opera Inedita,* ed. Brewer, p. 457 in RS, vol. 15.

[4] As I shall point out when I come to Roger Bacon, there are one or two rather striking resemblances between his interests and method and those of Neckam.

[5] II, 155.

Science and the Bible.

Although a Christian clergyman, Neckam seems to experience little difficulty in adopting the scientific theories of Aristotle; or, if there are Aristotelian doctrines known to him with which he disagrees, he usually quietly disregards them.[4] But he does raise the question several times of the correctness of Biblical statements concerning nature. He explains that Adam's body was composed of all four elements and not made merely from earth, as the account of creation in the Book of Genesis might seem to imply.[5] And of the scriptural assertion that "God made two great lights" he says, "The historical narrative follows the judgment of the eye and the popular notion," but of course the moon is not one of the largest planets.[6] In a third chapter entitled, "That water is not lower than earth," he notes that the statement of the prophet that "God founded the earth upon the waters" does not agree with Alfraganus' dictum that there is one sphere of earth and waters.[7] Wright quite unreasonably interprets this chapter as showing "to what a degree science had become the slave of scriptural phraseology."[8] What it really shows is just the contrary, for even the Biblical expositors, Neckam tells us, say that the passage is to be taken in the sense that one speaks of Paris as located on the Seine. Neckam then makes a suggestion of his own, that what is really above the waters is the terrestrial paradise, since it is even beyond the sphere of the moon, and Enoch, translated thither, suffered no inconvenience whatever from the waters of the deluge. Moreover, the terrestrial paradise symbolizes the church which is founded on the waters of baptism. All of which is of course far-fetched and fanciful, but in no way can be said to make science "the slave of scriptural phraseology." On the contrary it makes scriptural phraseology the slave of mysticism, while it subjects Enoch's translation to somewhat material limitations. Possibly there may be used here some of the apocryphal books current under Enoch's name.[1] On one occasion Neckam does accept a statement of the Bible which seems inconsistent with the views of philosophers concerning the four elements. This is the assertion that after the day of judgment there will be neither fire nor water but only air and earth will be left. To an imaginary philosopher who seems unwilling to accept this assertion Neckam says, "If you don't believe me, at least believe Peter, the chief of the apostles, who says the same in his canonical epistle. Says what? Says that fire and water will not exist after the judgment day."[2] But if Neckam prefers to believe his Bible as to what will occur in the world of nature after the day of judgment, he prefers also, as we have seen, to follow natural science in regard to present natural phenomena. Moreover, in neither the canonical nor apocryphal books can I find any such statement in the Epistles of Peter as Neckam here credits him with, unless after the elements have melted with fervent heat, the new heavens and a new earth are to be interpreted as made respectively of air and earth!

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[1] II, 174.

[2] For instance, II, 148. "Qui autem in naturis rerum instructi sunt."

[3] II, 99.

[4] I, 16, a citation from Aristotle gives him a little trouble.

[5] II, 152.

[6] I, 13. "Sed visus iudicium et vulgarem opinionem sequitur historialis narratio."

[7] II, 49.

[8] Preface, p. xxx.

His own knowledge of science.

We may agree at least with Wright that Neckam's scientific attainments are considerable for his time. In physics and astronomy he shows himself fairly well versed. He knows something of vacuums and syphoning; he argues that water tends naturally to take a spherical shape;[1] he twice points out that the walls of buildings should not be exactly parallel, since they should ultimately meet, if prolonged far enough, at the center of the earth;[2] and he asserts that the so-called "antipodes" are no more under our feet than we are under theirs.[3] He gives us what is perhaps our earliest information of some medieval inventions, such as the mariner's compass and mirrors of glass.[4] But he does not attempt to explain differences in the images in convex and concave mirrors.[5] He is modest in regard to his biological attainments, saying that he "is not ashamed to confess" that there are species of which he does not even know the names, to say nothing of their natures.[6] But when Wright calls Neckam's account of animals "a mere compilation" and says that "much of it is taken from the old writers, such as Solinus, Isidore, and Cassiodorus,"[7] he is basing his conclusion simply on the fact that marginal notes in the medieval manuscripts themselves ascribe a number of passages to these authors. This ascription is correct. But there are many passages on animals where the manuscripts name no authorities, and with one exception—the chapter on the hyena from Solinus—Wright fails to name any source from which Neckam has borrowed these other passages. It is easy to show that Neckam is a compiler when he himself or others have stated his authorities but it is equally fair to suppose that he is honest and original when he cites no authorities or has not been detected in borrowing. And he sometimes criticizes or discriminates between the earlier writers. After quoting Bernard Silvester's statement that the beaver castrates itself to escape its hunters, he adds, "But those who are more reliably informed as to the natures of things assert that Bernard has followed the ridiculous popular notion and not reached the true fact." [1] Neckam also questions the belief that a lynx has such keen sight that it can see through nine walls. This is supposed to have been demonstrated experimentally by observing a lynx with nine walls between it and a person carrying some raw meat. The lynx will move along its side of the walls whenever the meat is moved on the other side and will stop opposite the spot where the person carrying the meat stops. Neckam does not question the accuracy of this absurd experiment, but remarks that some natural scientists attribute it rather to the animal's sense of smell than to its power of vision.[2]

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[1] See *I Hermas*, iii, 42. "Hear therefore why the tower is built upon the water: because your life is and shall be saved by water. . . ."

[2] I, 16.

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[1] II, 14. Vitruvius, VIII, v. 5, ascribes this doctrine to Archimedes.

[2] II, 172; and p. 109 of *De utensilibus.*

[3] II, 49.

[4] Wright points out (p. l, note) that in Beckman's *History of Inventions* no instances are given of allusions to glass mirrors earlier than the middle of the thirteenth century.

[5] II, 154.

[6] II, 99.

[7] P. xxxix.

Incredible stories of animals.

But as a rule Neckam's treatment of animals is far more credulous than sceptical. He believes that the barnacle bird is generated from fir-wood which has been soaked in the salt water for a long time,[3] and that the wren, after it has been killed and is being roasted, turns itself on the spit.[4] He tells a number of delightful but incredible stories in which animals display remarkable sagacity and manifest emotions and motives similar to those of human beings. Some of these tales concern particular pets or wild beasts; others are of the habits of a species. The hawk, for example, keeps warm on wintry nights by seizing some other bird in its claws and holding it tight against its own body; but when day returns it gratefully releases this bird and satisfies its morning appetite upon some other victim.[5] Neckam also shares the common belief that animals were acquainted with the medicinal virtues of herbs. When the weasel is wounded by a venomous animal, it hastens to seek salubrious plants. For "educated by nature, it knows the virtues of herbs, although it has neither studied medicine at Salerno nor been drilled in the schools at Montpellier." [6]

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[1] II, 140.

[2] II, 138.

[3] I, 48.

[4] I, 78.

[5] I, 25.

[6] II, 123. This reminds one of the account of the tunny fish by Plutarch which we noted in our chapter on Plutarch, where he says that the tunny fish needs no astrological canons and is familiar with arithmetic; "Yes, by Zeus,

A chapter on the cock.

Neckam's chapter on the barnyard cock perhaps will illustrate the divergences between medieval and modern science as well as any other. As a rooster approaches old age, he sometimes lays an egg upon which a toad sits, and from which is hatched the basilisk. How is it that the cock "distinguishes the hours by his song"? From great heat ebullition of the humors within the said bird arises, it produces saltiness, the saltiness causes itching, from the itching comes tickling, from the tickling comes delectation, and delectation excites one to song. Now nature sets certain periods to the movements of humors and therefore the cock crows at certain hours. But why have roosters crests and hens not? This is because of their very moist brains and the presence near the top of their heads of some bones which are not firmly joined. So the gross humor arising from the humidity escapes through the openings and produces the crest.[1]

Effect of sin upon nature.

Neckam harbored the notion, which we met long before in the pagan Philostratus, in the Hebraic Enoch literature, in the Christian *Pseudo-Clementines* and Basil's *Hexaemeron,* and more recently in the writings of Hildegard, that man's sin has its physical effects upon nature. To Adam's fall he attributes not only the spots on the moon but the wildness of most animals, and the existence of insects to plague, and venomous animals to poison, and diseases to injure mankind.[2] But for the fall of man, moreover, all living creatures would be subsisting upon a vegetarian diet.

Neckam on occult virtues.

Magic is hardly mentioned in the *De naturis rerum.* In a passage, however, telling how Aristotle ordered some of his subtlest works to be buried with him, Neckam adds that he so guarded the neighborhood of his sepulcher "by some mysterious force of nature or power of art, not to say feat of the magic art, that no one in those days could enter it." [3]

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and with optics, too." It is unlikely that Neckam was acquainted with Plutarch's *Essays*.

[1] I, 75; the reasoning is somewhat similar to Adelard of Bath's explanation why his nephew wept for joy.

[2] II, 156.

[3] II, 189.

But Neckam is a believer in occult virtues and to a certain extent in astrology. He would also seem to believe in the force of incantations from his assertion that "in words and herbs and stones diligent investigators of nature have discovered great virtue. Most certain experience, moreover, makes our statement trustworthy."[1] He mentions a much smaller number of stones than Marbod, but ascribes the same occult virtues to those which he does name. In the preface to his first book he says that some gems have greater virtue when set in silver than when set in gold. A tooth separated from the jaw of a wild boar remains sharp only as long as the animal remains alive, an interesting bit of sympathetic magic.[2] The occult property of taming wild bulls possessed by the fig-tree which we have already seen noted by various authors is also remarked by Neckam.[3] A moonbeam shining through a narrow aperture in the wall of a stable fell directly on a sore on a horse's back and caused the death of a groom standing nearby. Out-of-doors the effect would not have been fatal, since the force of the moon's rays would not have been so concentrated upon one spot and the humidity would have had a better chance to diffuse through space.[4]

Fascination.

After telling of the fatal glances of the basilisk and wolf, Neckam says that fascination is explained as due to evil rays from someone who looks at you. He adds that nurses lick the face of a child who has been fascinated.[5]

His limited belief in astrology.

Neckam will not believe that the seven planets are animals.[6] He does believe, however, that they not merely adorn the heavens but exert upon inferiors those effects which God has assigned to them.[7] Each planet rules in turn three hours of the day. As there are twenty-four hours in all, the last three hours of each day are governed by the same planet which ruled the first three. Hence the names of the days in the planetary week, Sunday being the day when the sun governs the first three and last three hours, Monday the day when the moon controls the opening and closing hours of day, and so on.[1] But the stars do not impose necessity upon the human will which remains free. Nevertheless the planet Mars, for instance, bestows the gift of counsel; and science is associated with the planet Venus which is hot and moist, as are persons of sanguine temperament in whom science is wont to flourish. Neckam also associates each of the seven planets which illuminate the universe with one of the seven liberal arts which shed light on all knowledge.[2] He alludes to the great year of which the philosophers tell, when after 36,000 years the stars complete their courses,[3] and to the music of the spheres when, to secure the perfect consonance of an octave, the eighth sphere of the fixed stars completes the harmony of the seven planets. But he fears that someone may think he is raving when he speaks with the philosophers of this harmony of the eight spheres.[4]

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[1] II, 85.

[2] II, 139.

[3] II, 80.

[4] II, 153; this item is also found in the *De Natura rerum* of Thomas of Cantimpré.

[5] II, 153.

[6] I, 9.

[7] I, 7.

Neckam's farewell.

At Jesus College, Oxford, in a manuscript of the early thirteenth century, which is exclusively devoted to religious writings by Neckam,[5] there occurs at the close an address of the author to his work, which is in the same hand as the rest of the manuscript, which we may therefore not unreasonably suppose to have been Neckam's own writing. As he is spoken of in the manuscript as abbot of Cirencester, perhaps these are also actually the last words he wrote. We may therefore appropriately terminate our account of Neckam by quoting them.

"Perchance, O book, you will survive Alexander, and worms will eat me before the book-worm gnaws you; for my body is due the worms and book-worms will demolish you. You are the mirror of my soul, the interpreter of my meditations, the surest index of my meaning, the faithful messenger of my mind's emotions, the sweet comforter of my grief, the true witness of my conscience. To you as faithful depositary I have confided my heart's secrets; you restore faithfully to me those things which I have committed to your trust; in you I read myself. You will come, you will come into the hands of some pious reader who will deign to pour forth prayers for me. Then indeed, little book, you will profit your master; then you will recompense your Alexander by a most grateful interchange. There will come, nor do I begrudge my labor, the devotion of a pious reader, who will now let you repose in his lap, now move you to his breast, sometimes place you as a sweet pillow beneath his head, sometimes gently closing you with glad hands, he will fervently pray for me to Lord Jesus Christ, who with Father and Holy Spirit lives and reigns God through infinite cycles of ages. Amen."

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[1] I, 10. See p. 670 for Bacon's different account of this point.

[2] II, 173.

[3] I, 6.

[4] I, 15.

[5] Jesus 94. The MS includes a gloss on the psalter, a commentary on the proverbs of Solomon, two sermons, and three books on "The strong woman who will come."

CHAPTER XLIV

MOSES MAIMONIDES (MUSA IBN MAIMUN) 1135-1204

His life—His works in the west—His works in Latin—Attitude to science and religion—Attitude to magic—Towards empiricism—Abuse of divine names—Occult virtue and empirical remedies in his work on poisons—Attitude to astrology—Divination and prophecy—Marvels in the *Aphorisms.*

His life.

In this chapter we turn to consider perhaps the leading representative of Hebrew learning in the middle ages, Moses Maimonides [1] or Musa ibn Maimum or Moses ben Maimon, as he is variously briefly styled, not to entangle ourselves in the intricacies of his full Arabic name. In the Latin versions of his works he is spoken of as Rabbi Moyses of Cordova [2] or is made to call himself an Israelite of Cordova,[3] but it seems to have been not much more than the scene of his birth and childhood, since the invasion of the fanatical Almohades in 1148 forced his father to flee with his family first from place to place in Spain, in 1160 to Fez, later to Syria and Egypt. From about 1165 on Maimonides seems to have lived most of the time at Cairo and there to have done most of his work. After the deaths of his father and brother forced him to earn a livelihood by practicing medicine, he became physician to the vizier of Saladin and head of the Jewish community in Cairo.

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[1] In English, besides the article on Maimonides in the *Jewish Encyclopedia,* there is a rather good essay by Rabbi Gottheil in Warner's *Library of the World's Best Literature.* Recent works in French and German are: L. G. Lévy, *Maimonide,* 1911; *Moses ben Maimon, sein Leben, seine Werke, und sein Einfluss, zur Erinnerung an den siebenhundertsten Todestag des Maimonides, herausg. v. d. Gesell. z. Förderung d. Wiss. d. Judenthums durch W. Bacher, M. Brann, D. Simonsen, J. Guttmann,* 2 vols., containing twenty essays by various contributors, Leipzig, 1908 and 1914. L. Finkelscherer, *Mose Maimunis Stellung zum Aberglauben und zur Mystik,* Breslau, 1894; a Jena doctoral dissertation, full of somewhat juvenile generalizations, and which fails to appraise Maimonides' attitude towards magic, astrology, and superstition comparatively. See also D. Joël, *Der Aberglaube und die Stellung des Judenthums zu demselben,* 1881-1883. Other older works on Maimonides are listed in the bibliography in the *Jewish Encyclopedia. The Guide of the Perplexed* (Moreh Nebukim) was translated by M. Friedländer, second edition, 1904, and I have also used the Latin translation of 1629. The *Yad-Hachazakah* was published in 1863; *The Book of Precepts,* in 1849; the *Commentary on the Mishnah,* in 1655. Other works will be listed in the four following foot-notes.

[2] "Rabymoyses Cordubensis," fols. 1r and 13v of the Latin translation of his work on Poisons by Ermengard Blasius of Montpellier in an Oxford MS, Corpus Christi College 125.

[3] "Moysi israhelitici," on the first page of a Latin translation printed in 1477 (?)—numbered IA.27063 in the British Museum—from his "Yad Hachazakah," under the title, "De regimine sanitatis omnium hominum sub bre-

His works in the west.

Whether or not he returned to Spain before his death in 1204, he was certainly known to the western world of learning. In 1194 he wrote a letter on the subject of astrology in response to inquiries which he had received from Jews of Marseilles.[1] In it he tells them that his *Repetition of the Law* (*Iteratio legis*) has already spread through the island of Sicily. But he apparently was still in Cairo, where in July, 1198, he wrote his treatise on Poisons for the Cadi Fadhil.[2] After his death, however, it was between the conservative and liberal parties among the Jews of France and Spain that a struggle ensued over the orthodoxy of his works, which was finally settled, we are told, by reference in 1234 to the Christian authorities, who ordered his books to be burned. His *Guide for the Perplexed,* first published in Egypt in Arabic in 1190, had been translated into Hebrew at Lunel in southern France before the close of the twelfth century, and then again by a Spanish poet.[3] But the rabbis of northern France opposed the introduction of Maimonides' works there and, when they were anathematized for it by those of the south, are said to have reported the writings

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viloquio compilatus." In the Latin version of the *Aphorisms* printed in 1489 (numbered IA.28878 in the British Museum), "ait Moyses filius servuli dei israeliticus cordubensis," and "Incipiunt aphorismi excellentissimi Raby Moyses secundum doctrinam Galieni medicorum principis."

[1] Moses ben Maimon, *De astrologia . . . epistola,* 1555, Hebrew text and Latin translation.

[2] See the preface as given in the French translation by I. M. Rabbinowicz, Paris, 1865. There is a German translation by M. Steinschneider, *Gifte und Ihre Heilungen,* Berlin, 1873.

[3] Lévy (1911), 237.

to the Inquisition. The Maimonist party then accused them of delation and several of them were punished by having their tongues cut out.[1]

His works in Latin.

If certain Christian authorities really did thus burn the books of Maimonides, their action was unavailing to check the spread of his writings even in Christian lands, and certainly was not characteristic of the attitude of Christian Latin learning in general. *The Guide of the Perplexed* had already been translated into Latin before 1234,[2] and we find Moses of Cordova cited by such staunch churchmen as Alexander of Hales, Albertus Magnus,[3] Thomas Aquinas, and Vincent of Beauvais. It was for Pope Clement V himself that Ermengard Blasius of Montpellier translated at Barcelona Maimonides' work on Poisons at the beginning of the fourteenth century from Arabic into Latin.[4]

Attitude to science and religion.

It was not surprising that Albert and Aquinas should cite Maimonides, for he did for Jewish thought what they attempted for Christian, namely, the reconciliation of Aristotle and the Bible, philosophy and written revelation. If he anteceded them in this and perhaps to some extent showed them the way, we must remember that William of Conches, who was earlier than he, had already faced this difficulty of the relations between science and religion, the scriptures and the writings of the philosophers, although he of course did not know all the books of Aristotle. As for Maimonides, continuing the allegorical method of Philo, he tried to discover in the Old Testament and Talmud all the Aristotelian philosophy, and was convinced that the prophets of old had received further revelations of a philosophical character, which had been transmitted orally for a time but then lost during the periods of Jewish wandering and persecution.[1] He defended Moses from the slurs of Galen who had charged the lawgiver with an unscientific attitude.[2] He denied the eternity of matter[3] and of the heavens,[4] but held that the celestial bodies were living animated beings and that the heavenly spheres were conscious and free.[5] He spoke of belief in demons as "idle and fallacious," holding that evil is mere privation and that the personal Devil of Scripture was an allegory for this, while the possession by demons was merely the disease of melancholy.[6] Yet he believed that God does nothing without the mediation of an angel and that belief in the existence of angels is only second in importance to a belief in God.[7] Thus the rationalism and scepticism which modern Jewish admirers have ascribed to Maimonides had their decided limitations.

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[1] Lévy (1911), 233, who cites "pour le détail" Kobéç III; 'Henda ghenonza, 18, Königsberg, 1856; Taam zeqanim, Frankfurt, 1854.

[2] Lévy (1911), 261, "Le Guide avait dû être traduit en latin au début du XIIIe siècle, attendu que, dès ce moment, on relève des traces de son influence dans la scolastique. . . . Moïse de Salerno déclare qu'il a lu le Guide en latin avec Nicolo Paglia di Giovenazzo, qui fonda en 1224 un convent dominicain à Trani."

According to Gottheil, it was this Latin translation of the Guide which the Jewish opponents of Maimonides' teaching induced the church to consign to the flames.

The Latin translation in CUL 1711 (Qi. I. 19), fols. 1-183, is ascribed in the catalogue to Augustinus Justinianus, Nebiensium Episcopus, and is said to have been printed in Paris, 1520.

[3] M. Joël, *Verhältnis Albert des Grossen zu Moses Maimonides*, 1863. A. Rohner, *Das Schöpfungsproblem bei Moses Maimonides, Albertus Magnus, und Thomas von Aquin*, 1913.

[4] See his preface in Corpus Christi 125, fol. 1r.

Attitude to magic.

An interesting discussion of magic occurs in the *Guide for the Perplexed*[8] in connection with the precepts of the Mosaic law against idolatry. Maimonides holds that magicians and diviners are closely akin to idolaters, and this part of his discussion is very similar to patristic treatments which we have already encountered. He goes on, however, to say that astrology and magic were especially characteristic of the Chaldeans, Egyptians, and Canaanites, and to distinguish three varieties of magic: one employing the properties of plants, animals and metals; a second determining the times when these works should be performed;

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[1] *Jewish Encyclopedia*, p. 74.

[2] *Aphorismi* (1489), partic. 25. "Et ostendam hac demonstratione quod insipientia quam attribuit Moysi erat attribuenda ipsi Galieno vere et ponam dictum meum inter eos sicut inter duos sapientes unum compilatiorem alio. . . ."

[3] JE, p. 77.

[4] Lévy (1911), p. 86.

[5] Lévy (1911), p. 84.

[6] Finkelscherer (1894), pp. 40-51.

[7] Lévy, pp. 89-90.

[8] *More Nevochim* (1629), III, 37.

a third employing gesticulations, actions, and cries of the human operator himself. Thus he recognizes the three elements of materials, times, and rites in magic. He sees that they may be combined in one operation, as when an herb is plucked when the moon is in a specified degree. He notes that magic is largely performed by women, towards whom men are more merciful than towards their own sex. He also notes that magicians claim to do good or at least to ward off evils such as snakes and wild beasts or the blight from plants. But the lawgiver forbade "all those practices which contrary to natural science are said to produce utility by special and occult virtues and properties, . . . such forsooth as proceed not from a natural cause but a magical operation and which rely upon the constellations to such a degree as to involve worship and veneration of them." [1]

Towards empiricism.

But then Maimonides goes on to say that "everything is licit in which any natural cause appears." And he goes farther than that. He says that the reader need not feel uneasy because the rabbis have allowed the use in suspensions of a nail from the yoke worn by criminals or the tooth of a fox. "For in those times they placed faith in these things because they were confirmed by experience and served in the place of medicine." Similarly in Maimonides' own day Galen's remedy of the suspension of a peony from the patient's neck was employed in cases of epilepsy, dog's dung was used against pustules and sore throat, and so forth. "For whatever is proved by experience to be true, although no natural cause may be apparent, its use is permitted, because it acts as a medicine." Thus he condemns magic, but approves of empirical medicine as well as of natural science, and evidently does not regard the employment of occult virtues as necessarily magical and forbidden.

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[1] ". . . interdixit omnia ea quae contra speculationem naturalem specialibus et occultis viribus ac proprietatibus utilitatem afferre asserunt . . . talia videlicet quae non ex ratione naturali sed ex opere magico sequuntur et stellarum dispositionibus ac rationibus innituntur, unde necessario ad colendas et venerandas illas devenitur."

Abuse of divine names.

In another passage of the *Guide* Maimonides cautions, however, against the abuse of divine names, and, while he holds to the Tetragrammaton "which is written but is not pronounced as it is spelled," deplores the many inventions of meaningless and inefficacious names which superstitious and insane men have too often imposed upon the credulity of good men as possessed of peculiar sanctity and purity and having the virtue of working miracles. He therefore warns his readers against such "amulets or experimental charts." [1]

Occult virtue and empirical remedies in his work on poisons.

Maimonides again approves of empirical remedies and of occult virtues in his treatise on poisons. He holds that counter-poisons do not act by any physical or chemical quality but by their entire substance or by a special property.[2] Lemon pips, peeled and applied in a compress; a powdered emerald, which should be a beautiful green, quite transparent, and of good water; and the animal *bezoar,* which comes from the eyes or gall bladder of deer; these are antidotes whose efficacy is proved by incontestible experimentation. When *terra sigillata* cannot be had, a powdered emerald of the sort just described may be substituted for it as an ingredient in the grand theriac.[3] Maimonides believes that this last named remedy is the outcome of experiments with vipers carried on through the course of centuries by ancient philosophers and physicians.[4] As for the stone *bezoar,* the writings of the moderns are full of marvelous tales concerning it, but Galen does not mention it, and Maimonides has tried all the varieties which he could obtain against scorpion bites without the least success. But experience confirms the virtue of the *bezoar* of animal origin, as has been stated. Maimonides' observations concerning cures for the bites of mad dogs are interesting. He states that at first the bite of a mad dog does not feel any different from that of a dog who is not mad. He also warns his readers not to trust to books to distinguish between the two, but unless they are sure that the dog was not mad, to keep on the safe side by taking the remedies against the bite of a mad dog.[1] He also states that all of the various remedies listed for the cure of the bite of a mad dog must be employed before hydrophobia manifests itself, "for after the appearance of that symptom, I have never seen a patient survive." [2] In speaking of sucking the venom from a wound, Maimonides affirms that it is better to have this done by a fasting person, since the spittle of such a person is itself hostile to poisons.[3]

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[1] *More Nevochim* (1629), I, 61-62.

[2] French translation (1865), p. 26.

[3] *Ibid.,* pp. 27-28, 53-4.

[4] *Ibid.,* p. 38.

Attitude to astrology.

That Maimonides was well acquainted with the art of astrology may be inferred from his assertion that he has read every book in Arabic on the subject.[4] Maimonides not only believed that the stars were living, animated beings and that there were as many pure intelligences as there were spheres,[5] but he states twice in the *Guide for the Perplexed* [6] that all philosophers agree that this inferior world of generation and corruption is ruled by the virtues and influences of the celestial spheres. While their influence is diffused through all things, each star or planet also has particular species especially under its influence. According to Lévy [7] he further held not only that the movement of the celestial sphere starts every motion in the universe, but that every soul has its origin in the soul of the celestial sphere. In his letter on astrology to the Jews of Marseilles he repeats that all the philosophers have held, and that Hebrew masters of the past have agreed with them, that whatever is in this inferior world the blessed God has brought about by that virtue which arises from the spheres and stars. As God performs signs and miracles by angels, so natural processes and operations by the spheres and stars which are animated and endowed with knowledge and science. All this is true and in no way derogates from the Jewish faith. But Maimonides regards as folly and not wisdom the doctrine found in Arabic works of astrology that a man's nativity compels everything to happen to him just as it does and in no otherwise. He regards this doctrine as derived from the Chaldeans, Egyptians, and Canaanites and makes the rather rash assertion that no Greek philosopher ever wrote a book of this sort. This doctrine would make no distinction between a man whom a lion meets and tears limb from limb and the mouse which a cat plays with. It would make men warring for kingdoms no different from dogs fighting over a carcass. These illustrations may seem to the reader rather favorable to the doctrine which Maimonides is endeavoring to combat, but he upholds human free will and man's responsibility for his actions, which he declares are fundamental tenets of the Jewish law. For some reason which is not clear to me he identifies the doctrine of nativities and the control of human destiny by the constellations with the rule of blind chance and the happening of everything fortuitously, which would seem quite a different matter and third alternative.[1] Maimonides holds that God planned all human affairs beforehand, and that just as He planned the course of nature so as to allow for the occurrence of miracles, so He planned human affairs in such a way that men could be held responsible and punished for their sins. Maimonides regards the rule of chance and the doctrine of nativities as incompatible with this.

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[1] *Poisons* (1865), p. 43.

[2] *Ibid.*, p. 40.

[3] *Ibid.*, p. 21.

[4] So he states at the beginning of his *De astrologia* (1555).

[5] Lévy (1911), pp. 84-5.

[6] II, 5 and 10.

[7] Lévy (1911), p. 87.

Divination and prophecy.

Yet Maimonides believed in a human faculty of natural divination, stating that the ability to conjecture and divine is found in all men to some degree, and that in some imagination and divination are so strong and sure that they correctly forecast all future events or the greater part of them.[2] The difference between true prophets and the diviners and observers of times "is that the observers of times, diviners, and such men, some of their words may be fulfilled and some of them may not be fulfilled."[1]

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[1] And the following passage seems quite confused and illogical; but perhaps the fault is with the Latin translator: "Ad haec omnes illae tres sectae philosophorum qui asseverant omnia per sphaeras et stellas fieri etiam dicunt quicquid mortalibus contingit id casu temere et fortuito fieri et nullam de supernis causam habere, nec ea in re quicquam."

[2] *More Nevochim* (1629), II, 38.

Marvels in the *Aphorisms.*

In his *Aphorisms* which are drawn largely from the works of Galen Maimonides repeats many marvelous stories, instances of belief in occult virtue, and medical methods bordering upon the practice of magic.[2] Most of these have already been mentioned in our chapters upon Galen and need not be reiterated here. It is perhaps worth noting that Maimonides displays some critical sense as to the authenticity of works ascribed to Galen. He does not accept as his a treatise forbidding the burial of a man until twenty-four hours after his supposed death, although the patriarch who translated it from Greek into Arabic regarded it as Galen's. Maimonides suggests that it may be by some other Galen than the great physician "whose books are well known." Maimonides also notes that in the work of Hippocrates on female ailments which Galen commented upon and Hunain translated there have been added many statements of a marvelous character by some third hand.

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[1] *Yad-Hachazakah,* (1863), I, i, x, pp. 63-4.

[2] These occur in the 24th section which is devoted to medical marvels: "Incipit particula xxiiii continens aphorismos dependentes a miraculis repertis in libris medicorum." It is rather to Maimonides' credit that he segregated these marvels in a separate chapter.

CHAPTER XLV

HERMETIC BOOKS IN THE MIDDLE AGES

Prince Khalid ibn Jazid and *The Book of Morienus*—Robert of Chester's preface—The story of Morienus and Calid—The secret of the philosopher's stone—Later medieval works of alchemy ascribed to Hermes—Medieval citations of Hermes otherwise than as an alchemist—Astrological treatises—*Of the Six Principles of Things*—*Liber lune*—Images of the seven planets—*Book of Venus* of Toz Graecus—Further mentions of Toz Graecus—Toz the same as Thoth or Trismegistus—Magic experiments.

Prince Khalid ibn Jazid and *The Book of Morienus.*

AL-MAS'UDI, who lived from about 885 to 956 A. D., has preserved a single recipe for making gold from the alchemical poem, *The Paradise of Wisdom,* originally consisting of some 2315 verses and written by the Ommiad prince, Khalid ibn Jazid (635-704 A. D.) of Alexandria. Other Arabic writers of the ninth and tenth centuries represent this prince as interested in natural science and medicine, alchemy and astrology, and as the first to promote translations from the Greek and Coptic. Thus the alchemistic *Book of Crates* is said to have been translated either by him or under his direction. The *Fihrist* further states that Khalid was instructed in alchemy by one Morienes, who was himself a disciple of Adfar.[1] There is still extant, but only in Latin translation, what purports to be the book of this same Morienes, or Morienus as he is called in Latin, addressed to this same Khalid. The book cites or invents various Greek alchemists but claims the Thrice-Great Hermes as its original author. It is of this work that we shall now treat as the first of a number of medieval Hermetic books.

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[1] For detailed references for this and the preceding statements see Lippmann (1919), pp. 357-9.

Robert of Chester's preface.

One of the earliest treatises of alchemy translated from Arabic into Latin would appear to be this which Morienus Romanus, a hermit of Jerusalem, edited for "Calid, king of the Egyptians," and which Robert of Chester turned into Latin[1] on the eleventh day of February in the year 1182 of the Spanish era or 1144 A. D. Of Robert's other translations we have spoken elsewhere.[2] He opens his preface to the present treatise with an account of three Hermeses —Enoch, Noah, and the king, philosopher, and prophet who reigned in Egypt after the flood and was called Hermes Triplex. This account is very similar to one which we shall presently find prefixed to an astrological treatise by Hermes Trismegistus. It was this Hermes, Robert continues, who rediscovered and edited all the arts and sciences after the deluge, and who first found and published the present work, which is a book divine and most replete with divinity, and which is entitled, *The Book of the Composition of Alchemy*. "And since," says Robert, "what alchemy is and what is its composition, your Latin world does not yet know truly,[3] I will elucidate the same in the present treatise." Alchemy is that substance which joins the more precious bodies which are compounded from one original matter and by this same natural union converts them to the higher type. In other words, it is the philosopher's stone by which metals may be transmuted. Although Robert is a relatively young man and his Latinity perhaps not of the best, he essays the task of translating this so great and important a work and reveals his own name in the preface lest some other person steal the fruits of his labor and the praise which is his due. Lippmann dismisses the translation rather testily as "surpassed by no later work for emptiness, confusion, and sheer drivel,"[1] but we shall attempt some further description.

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[1] I have used the edition of Paris, 1564, *Liber de compositione alchemiae quem edidit Morienus Romanus Calid Regi Aegyptiorum Quem Robertus Castrensis de Arabico in Latinum transtulit*. A number of MSS of the work will be found listed in the index of Black's Catalogue of the Ashmolean MSS, and elsewhere, as in Sloane 3697 and Digby 162, 13th century, fols. 21v and 23r. Other editions are Basel, 1559; Basel, 1593, in *Artis Auriferae quam Chemiam vocant*, II, 1-54; and Geneva, 1702, in J. J. Manget, *Bibliotheca Chemica Curiosa*, I, 509-19.

[2] See above, chapter 38, p. 83.

[3] Berthelot (1893) I, 234, took the date to be 1182 A. D. and so, on the basis of this remark, placed the introduction of Arabic alchemy into Latin learning 38 years too late. It is rather amusing that Lippmann, who elsewhere avails himself of petty pretexts to belittle the work of Berthelot, should have overlooked this error. He still (1919), pp. 358 and 482, states the date as 1182 A. D., although he is puzzled how to reconcile it with that of 1143 A. D. for Robertus Castrensis or Robert de Retines. He also is at a loss as to the identity of this Robert or the meaning of "Castrensis," and has no knowledge of the publications of Karpinski (1915) and Haskins, EHR (1915).

The story of Morienus and Calid.

Following Robert's preface comes an account, in the usual style of apocryphal and occult works, told partly in the first person by Morienus and partly of him in the third person by someone else. Long after Christ's passion an Adfar of Alexandria found the book of Hermes, mastered it after long study, and himself gave forth innumerable precepts which were spread abroad and finally reached the ears of Morienus, then a young man at Rome. This reminds us of the opening of the *Recognitions* of Clement. Morienus left his home, parents, and native land, and hastened to Alexandria to the house of Adfar. When Adfar learned that Morienus was a Christian, he promised to divulge to him "the secrets of all divinity," which he had hitherto kept concealed from nearly everyone. When Adfar died, Morienus left Alexandria and became a hermit at Jerusalem. Not many years thereafter a king arose in Egypt named Macoya. He begat a son named Gezid who reigned after his father's death and in his turn begat a son named Calid who reigned after his death. This Calid was a great patron of science and searched all lands for someone who could reveal this book of Hermes to him. Morienus was still living, and when a traveler brought him news of Calid and his desire, he came to his court, not for the sake of the gifts of gold which the king had offered, but in order to instruct him with spiritual gifts. Saluting Calid with the words, "O good king, may God convert you to a better," he asked for a house or laboratory in which to prepare his masterpiece of perfection, but departed secretly as soon as it was consummated. When Calid saw the gold which Morienus had made, he ordered the heads to be cut off of all the other alchemists whom he had employed for years, and grieved that the hermit had left without revealing his secret.

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[1] Lippmann (1919), p. 358.

The secret of the philosopher's ston^e^

More years passed before Calid's trusty slave, Galip, learned the identity and whereabouts of Morienus from another hermit of Jerusalem and was despatched with a large retinue to bring him back. The king and the hermit at first engaged in a moral and religious discussion, and many days passed before Calid ventured to broach the subject of alchemy. He then put to Morienus a succession of questions, such as whether there is one fundamental substance, and concerning the nature and color of the philosopher's stone, also its natural composition, weight and taste, cheapness or expensiveness, rarity or abundance, and whether there is any other stone like unto it or which has its effect. This last query Morienus answered in the negative, since in the philosopher's stone are contained the four elements and it is like unto the universe and the composition of the universe. In the process of obtaining it decay must come first, then purification. As in human generation, there must first be *coitus,* then conception, then pregnancy, then birth, then nutrition. To such general observations and analogies, which are commonplaces of alchemy, are finally added several pages of specific directions as to alchemistic operations. Such enigmatic nomenclature is employed as "white smoke," and "green lion," but Morienus later explains to Calid the significance of most of these phrases. "Green lion" is glass; "impure body" is lead; "pure body" is tin, and so on.

In so far as I have examined the alchemical manuscripts of the later middle ages,[1] which I have not done very

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[1] Berthelot is a poor guide in any such matter since his pretentious volumes on medieval alchemy are based on the study of a comparatively small number of MSS at Paris. He made little or no use of the Sloane collection in the British Museum which is very rich in alchemical MSS, a subject in which Sir Hans Sloane was apparently much interested, or of the Ashmolean collection at Ox-

Later works of alchemy ascribed to Hermes.

extensively owing to the fact that most of them consist of anonymous and spurious compositions which are probably of a later date than the period with which we are directly concerned,[1] I have hardly found as many treatises ascribed to Hermes Trismegistus as might be expected. Perhaps as many works are ascribed to Aristotle, Geber, and other famous names as to Hermes or Mercury. Thus out of some forty items in an alchemical miscellany of the fourteenth or fifteenth century [2] two are attributed to Hermes and Mercury, two to Aristotle, one to Plato, three to Geber, two to Albertus Magnus, and others to his contemporaries like Roger Bacon, Brother Elias, Bonaventura, and Arnald of Villanova. Of the two titles connected with Hermes one is simply a *Book of Hermes;* the other, *A Treatise of Mercury to his disciple Mirnesindus.* Other specimens of works ascribed to Hermes in medieval Latin manuscripts are: *The Secrets of Hermes the philosopher, inventor of metals, according to the nature of transmutation* [3] or in another manuscript, "inventor of transformation," [4] a treatise

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ford, although Elias Ashmole edited the *Theatrum Chemicum Britannicum,* 1652, "containing several poetical pieces of our famous English philosophers who have written the hermetic mysteries in their own ancient language,"—a work in which Ashmole himself is called *Mercuriophilus Anglicus.*

[1] The two earliest MSS used by Berthelot for medieval Latin alchemy were BN 6514 and 7156 of the late 13th or early 14th century. In an earlier chapter we have mentioned Berlin 956 of the 12th century, fol. 21, "Hic incipit alchamia," and probably a fairly long list could be made of alchemical MSS of the 13th century, like Digby 162 mentioned in a previous note to this chapter. However, as a rule the numerous alchemical collections in the Sloane MSS—a majority of the MSS numbered from about 3600 to about 3900 are in whole or part concerned with alchemy, as well as a number of earlier numbers—are not earlier than the 14th and 15th centuries, and many are subsequent to the invention of printing.

[2] Riccard. 119.

[3] Sloane 1698, 14th century, fol. 53-, "Hic incipiunt secreta Hermetis inventoris metallorum secundum transmutationis naturam . . . / . . . Explicit Hermes de salibus et corporibus."

Corpus Christi, 125, fols. 39-42, "Incipiunt secreta Hermetis philosophi inventoris metallorum secundum mutacionis naturam."

[4] Library of the Dukes of Burgundy 4275, 13th century, Secreta Hermetis philosophi "Inventor transformationis." The preceding item 4274 is in the same MS and consists of an exposition of Hermes' words, "Quoniam ea quae . . ." etc.

on the fountain of youth by Trismegistus;[1] and a work on alcohol ascribed to "father Hermes."[2] The Early English Text Society has reprinted an English translation of the Latin treatise on the fifth essence "that Hermes, the prophet and king of Egypt, after the flood of Noah, father of philosophers, had by revelation of an angel of God to him sent," which was first published "about 1460-1476 by Fred J. Furnival."[3] "The book of Hermogenes" is also to be accredited to Hermes Trismegistus.[4]

Medieval citations of Hermes

Among the Arabs and in medieval Latin learning the reputation of Hermes continued not only as an alchemist, but as a fountain of wisdom in general. Roger Bacon spoke of "Hermes Mercurius, the father of philosophers."[5] Daniel of Morley we have heard cite works of Trismegistus and distinguish between "two most excellent authorities," the "great Mercury," and his nephew, "Trismegistus Mercurius."[6] Albertus Magnus cited "The so-called *Sacred Book* of Hermes to Asclepius,"[7] an astrological treatise of which the Greek version has been mentioned in our earlier chapter on Hermes, Orpheus, and Zoroaster. And Albert's contemporary, William of Auvergne, bishop of Paris, makes use several times[8] of the dialogue between Mercurius Trismegistus, "the Egyptian philosopher and magician," and Asclepius from a *Liber de hellera* or *De deo deorum,* which is presumably the Greek Ἱερὰ βίβλος. Trismegistus is represented as affirming that there is divine power in herbs and stones. In the *Speculum astronomiae*[1] Albert listed a number of bad books on necromantic images[2] by Hermes of which Christians were to beware: a book of images for each of the seven planets, an eighth treatise following them, a work on *The seven rings of the seven planets,* a book of magical illusions (*liber praestigiorum*),[3] and a book addressed to Aristotle. William of Auvergne seems to allude to the same literature when he twice repeats a story of two fallen angels from Hermes, citing his *Seven Planets* in one case and *Book of Venus* in the other.[4] Albertus Magnus also cites "books of incantations" by Hermes in his work on vegetables and plants;[5] and a *Liber Alcorath* is ascribed to Hermes in the *Liber aggregationis* or *Experimenta Alberti* which is current under Albert's name. The astrologer Cecco d'Ascoli in the early fourteenth century cites a treatise by Hermes entitled *De speculis et luce* (*Of mirrors and light*).[6] These few instances of medieval citation of Hermes could of course be greatly multiplied but suffice to suggest the importance of his name in the later history of magic and astrology as well as of alchemy.

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[1] Vienna 2466, 14th century, fols. 85-88, Trismegistus, aqua vite.

[2] Wolfenbüttel 2841, anno 1432, fols. 138-44v, De aque ardentis virtutibus mirabilibus que de vino utique fit. . . .

[3] Reprinted London, 1866; revised, 1889. Treatises of alchemy are also ascribed to Hermes in Sloane 2135, 15th century, and 2327, 14th century.

[4] Arezzo 232, 15th century, fols. 1-14, "Liber transmissus ab Alexandro rege ex libro Hermogenis"; Bodleian 67, fol. 33v (*Secret of Secrets* of the pseudo-Aristotle), "Et pater noster Hermogenes qui triplex est in philosophia optime philosophando dixit."

[5] *Opus minus,* ed. Brewer (1859), in RS XV, 313.

[6] Arundel 377, 13th century, *Philosophia magistri danielis de merlai,* fols. 89r, 92v; these citations, like many others, are not included in V. Rose's faulty list of Daniel's authorities in his article, "Ptolemaeus und die Schule von Toledo," *Hermes,* VIII (1874), 327-49.

[7] *De animalibus,* XX, i, 5, "dicit Hermes ad Esclepium."

[8] The passages are mentioned in the chapter on William of Auvergne; see below, p. 350.

Astrological treatises.

We may, however, briefly examine some specimens of the works themselves, chiefly, as in the citations, of a magical and astrological character, which are current under Hermes' name in the medieval manuscripts. A treatise on fifteen stars, fifteen stones, fifteen herbs, and fifteen images to be engraved on the stones, is ascribed sometimes to Hermes and sometimes to Enoch.[7] The number fifteen is difficult to

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[1] *Spec. astron.,* cap. 11 (*Opera,* ed. Borgnet, X, 641).

[2] A book on necromantic images by Hermes is listed in the 1412 A. D. catalogue of MSS of Amplonius: Math. 54.

[3] See in the same catalogue, Math. 9, Mercurii Colotidis liber prestigiorum.

[4] *Opera,* Venetiis, 1591, pp. 831, 898.

[5] *De veget. et plantis,* V, ii, 6.

[6] P. G. Boffito, *Il Commento di Cecco d'Ascoli all' Alcabizzo,* Firenze, 1905, p. 43.

[7] Catalogue of Amplonius (1412 A. D.) Mathematica 53, "Liber Hermetis de quindecim stellis, tot lapidibus, tot herbis, et totidem figuris." But in Amplon. Quarto 381, fols. 43-5, the work is ascribed to Enoch, whom it is not surprising that Robert of Chester classed as one of three Hermeses.

Ashmole 1471, 14th century,

relate to planets, signs, or decans; in fact the fifteen stars are fixed stars supposed to exceed others in virtue. John Gower in the fourteenth century treated of the same subject in his *Confessio amantis.*[1] In the middle ages a *Centiloquium,* or series of brief astrological dicta, was ascribed to Hermes as well as to Ptolemy. Some manuscripts imply that the *Centiloquium* of Hermes was a selection from the astrological treatises of Hermes put together by Stephen of Messina for Manfred, king of Sicily.[2] In a fifteenth century manuscript is ascribed to Hermes a Latin astrological treatise of considerable length opening with the thirty-six decans and their astrological influence [3] but dealing with various other matters bearing upon the prediction of nativities; and a much briefer but equally astrological

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fols. 50r-55, "Incipit liber Hermetis de 15 Stellis, 15 lapidibus, 15 herbis et 15 ymaginibus."

Ashmole 341, 13th century, fols. 120v-28.

Corpus Christi 125, fols. 70-75.

Royal 12-C-XVIII, 14th century.

Harleian 80, 14th century.

Harleian 1612.

Sloane 3847, 17th century.

BN 7440, 14th century, No. 4.

Vienna 5311, 14-15th century, fols. 37-40.

Vienna 3124, 15th century, fols. 161-2, De Stellis fixis, translatus a Mag. Salione, is perhaps the same work. This Salio, who seems to have been a canon at Padua, also translated Alchabitius on nativities from Arabic into Latin: *Ibid.,* fols. 96-123; BN 7336, 15th century, #13; S. Marco XI-110, 15th century, fols. 40-111.

By the fourteenth century the work had been translated into French:

CU Trinity 1313, early 14th century, fol. 11-, "Cy commence le livre Hermes le Philosofre parlaunt des 15 esteilles greyndres fixes et 15 pierres preciouses," etc.

[1] Sloane 3847, fol. 83. "What stones and hearbes are appropriated unto the 15 Starres accordinge to John Gower in his booke intituled *De confessione amantis.*"

[2] Amplon, Quarto 354, mid 14th century, fols. 1-3, "Centiloquium Hermetis . . . domino Manfrido inclito regi Cicilie Stephanus de Messana has flores de secretis astrologie divi Hermetis transtulit."

CLM 51, 1487-1503 A. D., fols. 46v-49, Hermetis divini Propositiones sive flores Stephanus de Messana transtulit. Other MSS are numerous.

Printed before 1500; I have used an edition numbered IA.11947 in the British Museum. It was printed behind Ptolemy at Venice in 1493.

[3] Harleian 3731, 15th century, fols. 1r-50r, "Incipit liber hermetis trismegisti de XXXVI decanis XII signorum et formis eorum et de climatibus et faciebus quas habent planete in eisdem signis." After this rubric the text opens, "Triginta sex autem decani"; closes, ". . . aspexerit illum dictis prius mori." It is obviously different from the Dialogue with Asclepius included in the works of Apuleius and longer than the Greek astrological text dealing with the thirty-six decans published by J. B. Pitra, *Analecta Sacra,* V, ii, 284-90. The discussion of the decans terminates at the bottom of fol. 2.

work on *Accidents,* which we are told was rewritten by Haly before it was translated into Latin.[1] Two books of "Hermes the Philosopher" on the revolutions of nativities by some unspecified translator were printed by H. Wolf in 1559.[2] A work on medical diagnosis of diseases from the stars without inspection of urine which is ascribed to Hermes in a Wolfenbüttel manuscript [3] would probably turn out upon examination to be the treatise on that theme of William of England.

Of the Six Principles of Things.

By the thirteenth century, if not before, a treatise was in existence by "Hermes Mercurius Triplex" on the six principles of things [4] with a prologue concerning the three Mercuries,[5] of whom we have already heard Robert of Chester speak in his preface. Here too the first is identified with Enoch, the second with Noah, and the third is called triplex because he was at once king, philosopher, and prophet, ruling Egypt after the flood with supreme equity, renowned in both the liberal and mechanical arts, and the first to elucidate astronomy. He wrote *The Golden Bough, Book of Longitude and Latitude, Book of Election, Canons on the Planets,* and a treatise on the astrolabe. Among his pastimes he brought to light alchemy which the philosopher Morienus developed in his writings. *The Six Principles of*

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[1] Harleian 3731, fols. 170v-172v, "Incipiunt sermones hermetis de accidentibus. Ordina significationes fortiorem . . . / . . . erit res egritudo. Explicit sermo hermetis de accidentibus rescriptus ab Haly."

[2] *Hermetis philosophi de revolutionibus nativitatum libri duo incerto interprete,* in an astrological collection by H. Wolf, Basel, 1559, pp. 201-79.

[3] Wolfenbüttel 2841, anno 1432 fols. 380-2. Liber Hermetis philosophi de iudiciis urine sine visu eiusdem urine et de prognosticatione in egritudinibus secundum astronomiam.

Vienna 5307, 15th century, fol. 150, has a "Fragmentum de iudicio urinae" ascribed to Hermes, but it follows the treatise of William of England.

[4] Digby 67, end of 12th century according to the catalogue but I should have placed it in the next century, fols. 69-78, "Hermes Mercurius Triplex de vi rerum principiis multisque aliis naturalibus; partibus quinque; cum prologo de tribus Mercuriis."

Bodleian 464, 1318 A. D., fols. 151-162r, Hermetis Trismegisti opuscula quaedam; primum de 6 rerum principiis, is almost identical.

[5] A *Liber mercurii trismegisti de tribus mercuriis* appears in the 15th century catalogue of the MSS of St. Augustine's Abbey, Canterbury.

Things is a treatise part astronomical and part astrological, considering the natures of the signs and the powers of the planets in their houses. Citations of such authors as Zahel and Dorotheus show that the work is much later than Hermes. It is followed by four other brief treatises, of which the first discusses time, the winds, pestilences, divination from thunder, and eclipses of the sun and the moon; the second and the third deal with the astrological topics, *Of the triple power of the celestial bodies,* and *Of the efficacy of medicines according to the power of the planets and the effect of the signs.* The fourth treatise tells how to use the astrolabe.

Liber lune.

Of the books of bad necromantic images for each of the seven planets by Hermes, which the *Speculum astronomiae* censured, at least one seems to have been preserved for our inspection in the manuscripts, since it has the same *Incipit* as that cited by Albert, *"Probavi omnes libros . . . ,"* and the same title, *Liber lune,*[1] or *Book of the Moon,* or, as it is more fully described, of the twenty-eight mansions and twenty-eight images of the moon and the fifty-four angels who serve the images. And as Albert spoke of a treatise of magic illusions which accompanied the seven books of necromantic images for the planets, so this *Liber lune* is itself also called *Mercury's magic illusion.*[2] It probably is the same *Book of Images of the Moon* which William of Auvergne described as attempting to work magic by the names of God. The treatise opens in the usual style of apocryphal literature by narrating how this marvelous volume came to be discovered. After some "investigator of wisdom and truth and friend of nature had read the volumes of many wise men," he found this one in a golden ark within a silver chest which was in turn placed in a casket of lead,—a variant on Portia's method. He then translated it into Arabic for the benefit of the many. Nevertheless we have the usual caution to fear God and not show the book to anyone nor allow any polluted man to touch it, since with it all evils as well as all goods may be accomplished. It tells how to engrave images as the moon passes through each of its twenty-eight houses. The names of angels have to be repeated seven times and suffumigations performed seven times in the name of God the merciful and pious. Just as the moon is nearer to us than other planets and more efficacious, so this book, if we understand it aright, is more precious than any other. Hermes declares that he has proved all the books of the seven planets and not found one truer or more perfect than this most precious portion. Balenuch, however, a superior and most skilful philosopher, does much of the talking for his master Hermes. The Latin text retains the Arabic names for the mansions of the moon, the fifty-four angels also have outlandish names, and a wood that grows in an island in India is required in the suffumigations. Instructions are given for engraving images which will destroy villa, region, or town; make men dumb; restrain sexual intercourse within a given area; heat baths at night; congregate ten thousand birds and bees; or twist a man's limbs. Four special recipes are given to injure an enemy or cause him to sicken.

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[1] Corpus Christi 125, fols. 62-68 ("Liber lunae" is written in the upper margin of fol. 62), "Hic incipit liber ymaginum tr. ab Hermete id est Mercurio qui latine prestigium Mercurii appellatur, Helyanin in lingua Arabica . . . / . . . Explicit liber lune de 28 mansionibus lune translatus ab Hermete."

Digby 228, 14th century, fols. 54v-55v, incomplete. Macray describes it as "'Liber lune'; tractatus de 28 mansionibus et 28 imaginibus lunae, et de 54 angelis 'qui serviunt ymaginibus.'"

Florence II-iii-214, 15th century, fol. 8-, "Dixit Hermes huius libri editor, lustravi plures imaginum"; fol. 9-, "Hec sunt ymagines septem planetarum et characteres eorum"; fols. 9-15, "liber ymaginum lune". . . . fols. 33-43, "Liber planetarum inventus in libris Hermetis."

[2] The Incipit, however, which Albert gave for Hermes' *Liber praestigiorum,* namely, "Qui geometriae aut philosophiae peritus, expers astronomiae fuerit," identifies it with Thebit ben Corat's work on images.

Hermes on images of the seven planets.

We shall leave until our chapter on the Pseudo-Aristotle "The book of the spiritual works of Aristotle, or the book *Antimaquis,* which is the book of the secrets of Hermes . . . the ancient book of the seven planets." But in at least one manuscript the work of Hermes on the images of the moon is accompanied by another briefer treatise ascribed to him on the images of the seven planets, one for each day of the week, to be made in the first hour of that day which is ruled by the planet after which the day is named. This little treatise begins with the words, "Said Hermes, editor of this book, I have examined many sciences of images." [1] Altogether I have noted traces of it in four manuscripts.

Book of Venus of Toz

In two of these manuscripts the work of Hermes on images of the seven planets is immediately followed by a work of Toc or Toz Graecus on the occult virtues of stones called the Book of Venus or of the twelve stones of Venus.[2] The first part of the treatise, however, consists of instructions, largely astrological in character but also including use of names of spirits and suffumigations, for casting a metal image in the name of Venus. Astrological symbols are to be placed on the breast, right palm, and foot of the image.

In the discussion of stones each paragraph opens with the words, "Said Toz." The use of these stones is mainly medicinal, however, and consists usually in taking a certain weight of the stone in question. Of astrology, spirits, and power of words there is little more said. Some marvelous virtues are attributed to stones nevertheless. With one, if you secretly touch two persons who have hitherto been firm friends, you will make them enemies "even to the end of the world. And if anyone grates from it the weight of one *argenteus* and mixes it with serpent's blood (possibly the herb of that name) and gives it to anyone to drink, he will flee from place to place."

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[1] See Florence II-iii-214, fols. 8-9, already listed with *Incipits* among the MSS of the *Liber lune* on p. 223, note 1 above. Also Bodleian 463, 14th century, written in Spain, fol. 77v, "Dixit hermes editor huius libri lustranti plures imaginum (?) scientias invenit." The work is mutilated at the end, as a leaf has been torn out between those now numbered 77 and 78. See also Sloane 3883, 17th century, fol. 95-; Arundel 342, fol. 78v, "Hermetis ut fertur liber de imaginibus et horis.

[2] Owing to the missing leaf above mentioned only the latter part of the *Liber Toc* is now contained in Bodleian 463. Sloane 3883, fols. 96r-99, "Liber Toc; et vocatur liber veneni (*sic*), et liber de lapidibus veneris. Dixit Toc Graecus observa Venerem cum perveniret ad pliades et coniuncta fuerit." In the text and Explicit, however, the author's name is often spelled Toz. This MS seems to be directly copied from Bodleian 463, for not only is it preceded by the Hermes on images for the seven planets and also by an "Instructio ptholomei" which deals with the subject of astrological images, but furthermore it exactly reproduces its text, down even to such a manuscript copyist's pi as "ad dumtanpo itulia" for "alicui ad potandum."

Further mentions of Toz Graecus.

Toz Graecus was cited by more than one medieval writer and the work which we have just been describing was not the only one that then circulated under his name, although it seems to be cited by Daniel Morley in the twelfth century.[1] Albertus Magnus in his list of evil books on images in the *Speculum astronomiae* included a work on the images of Venus,[2] another on the four mirrors of Venus, and a third on stations for the cult of Venus. This last is also alluded to by William of Auvergne, bishop of Paris, in his *De universo,* and ascribed by him to "Thot grecus." [3] There also was once among the manuscripts of Amplonius at Erfurt a "book of Toz Grecus containing fifty chapters on the stations of the planets." [4] Cecco d'Ascoli, the early fourteenth century astrologer, mentions together "Evax king of the Arabs and Zot grecus and Germa of Babylon." Which reminds one of Albert's allusion in his theological *Summa* [5] to "the teachings of that branch of necromancy" which treats of "images and rings and mirrors of Venus and seals of demons," and is expounded in the works of Achot of Greece—who is probably our Toz Graecus, Grema of Babylon, and Hermes the Egyptian. And again in his work on minerals[1] Albert lists together as authorities on the engraving of gems with images the names of Magor Graecus, Germa of Babylon, and Hermes the Egyptian.

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[1] Arundel 377, fol. 100v, "Thoz Grecus Liber Veneris."

[2] *Spec. astron.,* cap. 11 (Borgnet, X, 641), "Toz Graeci, de stationibus ad cultum Veneris" opening "Commemoratio historiarum"; "de quatuor speculis eiusdem" opening "Observa Venerem cum pervenerit ad Pleiades";—this is the Incipit of our treatise in Sloane 3883, but the title does not seem to fit very well; perhaps Albert, who says that he last looked at these bad books long ago and then with abhorrence, so that he is not sure he always has the titles and Incipits exact, has exchanged the Incipit with that of the third treatise, "de imaginibus veneris," which opens, "Observabis Venerem cum intrabit Taurum."

[3] *De universo* II, ii, 96 (p. 895, ed. 1591), "Thot grecus in libro quem scripsit de cultu veneris dixit quandam stationem cultus illius obtinere ab ipsa venere colentes septem qui illi et veneri serviant."

[4] Math. 8 in the catalogue of 1412 A. D., Liber Toz Greci continens 50 capitula de stacionibus planetarum.

[5] II, 30.

Toz the same as Thoth or Hermes Trismegistus.

Moreover, not only is the work of Toz closely associated both in the extant manuscripts and by Albertus Magnus with that of Hermes, but William of Auvergne's spelling "Thot" shows what has perhaps already occurred to the reader, that this Toc or Toz Graecus is no other than the Greek equivalent of the Egyptian god Thoth; in other words, Hermes Trismegistus himself. I have not yet mentioned one other treatise found in a seventeenth century manuscript, and which, while very likely a later invention, shows at least that Toz remained a name to conjure with down into modern times.[2] The work is called *A commentary by Toz Graecus, philosopher of great name, upon the books of Solomon to Rehoboam concerning secrets of secrets.* A long preface tells how Solomon summed up all his vast knowledge in this book for the benefit of his son Rehoboam, and Rehoboam buried it in his tomb in an ivory casket, and Toz after its discovery wept at his inability to comprehend it, until it was revealed to him through an angel of God on condition that he explain it only to the worthy.

Magic experiments.

The text is full of magic experiments: experiments of theft; experiments in invisibility; love experiments; experiments in gaining favor; experiments in hate and destruction; "extraordinary experiments"; "playful experiments"; and so on. These with conjurations, characters, and suffumigations make up the bulk of the first book. The second book deals chiefly with "how exorcists and their allies and disciples should conduct themselves," and with the varied paraphernalia required by magicians: fasts, baths, vestments, the knife or sword, the magic circle, fumigations, water and hyssop; light and fire, pen and ink, blood, parchment, stylus, wax, needle, membrane, characters, sacrifices, and astrological images. Two of its twenty-two chapters deal with "the places where by rights experiments should be performed" and with "all the precepts of the arts or experiments." In another seventeenth century manuscript are *Seven Books of Magical Experiments of Hermes Trismegistus.* "And they are magic secrets of the kings of Egypt," drawn, we are told, from the treasury of Rudolph II, Holy Roman emperor from 1576 to 1612.[1] Another manuscript at Vienna contains a German translation of the same work.[2]

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[1] II, iii, 3.

[2] BN 15127, fols. 1-100, Toz Graeci philosophi nominatissimi expositio super libros salomonis de secretis secretorum ad Roboam.

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[1] Wolfenbüttel 3338, 17th century, 43 fols.

[2] Vienna 11267, 17-18th century, fols. 2-31.

CHAPTER XLVI

KIRANIDES

Question of the origin of the work—Its prefaces—Arrangement of the text—Virtues of a tree—Feats of magic—An incantation to an eagle—Alchiranus—Treatises on seven, twelve, and nineteen herbs—Belenus.

Question of the origin of the work.

The virtues, especially medicinal, of plants and animals comprise the contents of a work in Latin of uncertain date and authorship, usually called the *Kiranides* of Kiranus, King of Persia.[1] Thomas Browne, in his *Pseudodoxia Epidemica* or *Inquiry into Vulgar Errors,* included in his list of "authors who have most promoted popular conceits, . . . *Kiranides,* which is a collection out of Harpocration the Greek and sundry Arabick writers delivering not only the Naturall but Magicall propriety of things, a work as full of vanity as variety, containing many relations, whose invention is as difficult as their beliefs, and their experiments sometime as hard as either."[2] The work purports to be a translation from the Greek version which in its turn was from the Arabic,[3] and Berthelot affirms[4] that in antiquity *Kiranides* was cited by Galen and by Olympiodorus, the historian and alchemist of the early fifth century, while Kroll cites a Greek manuscript at Paris as ascribing the third book of *Kiranides* to Hermes Trismegistus.[1]

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[1] I know of no very early printed editions, but have consulted a copy published at Leipzig in 1638, and two MSS, Ashmole 1471, late 14th century, fols. 143v-167r, and Arundel 342, 14th century, in an Italian hand. The work is also contained either *in toto* or brief excerpt in several Sloane MSS, and was printed in English in 1685 as *The Magick of Kiranus.* See also Wolfenbüttel 1014, 15th century, fol. 102, *De libro Kyranidis Kyrani, regis Persarum.* I have not seen P. Tannery, *Les Cyranides,* in *Congrès international d'histoire des sciences,* Geneva, 1904.

[2] I, 8.

[3] See Black's description of Ashmole 1471, "Translator qui libros tres operis huius . . . e Gracca versione (ex Arabico textu anno·377 facta) . . . Latinos fecit."

[4] Berthelot (1885) p. 47.

Its prefaces.

The preface of the medieval Latin translator is by "a lowly cleric" who addresses some ecclesiastical or scholastic superior, possibly the Chancellor at Paris.[2] He marvels that the mind of his patron, which has penetrated beyond the seven heavens to contemplate supernatural things above our sphere, should nevertheless not disdain an interest in the most lowly of terrene "experiments." The master has asked him to translate this medical book from Greek into Latin, a task easier to ask than to execute. There are several Greek versions of it, all professedly translations from some oriental original, but the volume which his patron gave him to translate into Latin is that translated into Greek at Constantinople in 1168[3] or 1169[4] by order of the Byzantine emperor, Manuel Comnenus, whom we shall also find associated with the *Letter of Prester John* of which we shall treat in the next chapter. The translator speaks of the work as *The Book of Natural Virtues, Complaints, and Cures,* but adds that it is a compilation from two other books, namely, *The Experience of the Kiranides of Kiranus, King of Persia,* and *The Book of Harpocration*[5] *of Alexandria to his Daughter.* There then follows the preface of Harpocration to his daughter, which tells of a certain city and of encountering an aged sage there, of great towers and of precious writing on a column which Harpocration proceeds to transcribe. We are given to understand that the original was written in "antique archaic Syriac" and was as old as the Euphrates.

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[1] Article *Hermes Trismegistus* in PW 798.

[2] Ashmole 1471, fols. 143v-167r, "Incipit liber Kirannidarum in quo premittitur tale prohemium. Prudentissimo domino Magistro Ka. Parissen. infimus clericus salutem." The translator's address to his patron sounds a little like Hugh of Santalla, but a date after 1168 is rather late either for Hugh or the anonymous Sicilian translator of the Almagest, whom the association in this case with Paris also tends to preclude. Possibly the translator may be Philip, the cleric of Tripoli, who speaks of himself in a similarly humble style, and of whom we shall speak in the next two chapters.

[3] According to the printed text of 1638.

[4] Ashmole 1471, *"anno Christi* 1280 *aliter* 1169."

[5] Harpocration is cited by Galen: see Kühn XII, 629, "ad aures purulentas Harpocration."

Arrangement of the text.

The text is divided into four books, each arranged alphabetically. The first book subdivides into "Elements." For example, *Elementum XII* is devoted to a tree, a bird, a stone, and a fish, each of which begins with the letter M. Most, however, of the virtues and medicinal prescriptions which follow have to do with the tree or herb only. The second book treats of beasts or quadrupeds, the third of birds, and the fourth of fish.

Virtues of a tree.

Much superstition and magical procedure is found scattered through, or better, crowded into, the book. For instance, in a medicinal application of the cyme of the tree Μορέα, one is to face the southwest wind, use two fingers of the left hand to remove the cyme, then look behind one toward the east, wrap the cyme in purple or red silk (*vera?*), and touch the patient with it or bind it about her. In another recipe the fruit of this tree is to be compounded in varying proportions with such substances as an Indian stone and the tips of the wings of crows and is then to be stirred with a crow's feather until the mixture is "soft and sticky." In a third prescription a stone engraved with an image of the fish mentioned under the letter M—μόρμυρος, and enclosed in an iron box, is to be combined with the "eyes" (buds?) of the tree *Morea* as an amulet against certain ills.

Feats of magic.

In some cases the end sought as well as the procedure employed is magical rather than medicinal. In another chapter of the first book, for example, the reader is instructed how to make a *licinium* or combustible compound in whose light those present will appear to one another like flaming demons. Or in book two the reader is told that wearing the dried tongue of a weasel inside his socks will close the mouths of his enemies. The weasel's testicles, right and left, are used as charms to stimulate and prevent conception respectively.

An incantation to an eagle.

Incantations are employed in connection with the eagle, the first of forty-four birds taken up in the third book. Catch one, collect the dung it makes during the first day and night of its captivity, then bind its feet and beak and whisper in its ear, "Oh, eagle, friend of man, I am about to slay you for the cure of every infirmity. I conjure you by the God of earth and sky and by the four elements that you efficaciously work each and every cure for which you are oblated." The eagle is then decapitated with a sword composed entirely of iron, all its blood is carefully caught in a bowl, its heart and entrails are removed and placed in wine, and other directions observed. The discussion of the virtues of fish in the fourth and last book is essentially identical in character with the examples already given for plants, birds, and beasts.

Alchiranus.

In a sixteenth century manuscript at Venice [1] is a Latin version which would seem to be translated from the Arabic since it gives the author's name as Alchiranus, although some scholiast has interpolated and added to the words of this author and of Harpocration. As described by Valentinelli the arrangement into books is the same as that which we have noted. Valentinelli also was impressed by the fact that "medical substances are used to produce not merely physical but moral effects, such as prescience of the future, dispelling demons and evil phantoms, avoiding shipwreck by binding the heart of a *foca* to the mast of the vessel; discovering what sort of life a woman has led, becoming invisible, averting storms, perils, wild beasts, robbers." And further that "the efficacy of the medicaments is dependent upon their mode of preparation or application, at the rising or setting of the sun, at the waning or waxing of the moon, by uttering certain words or engraving stones." [2]

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[1] S. Marco XIV, 37, fols. 11-73 Alchirani, liber de proprietatibus rerum. Liber physicalium virtutum, compassionum et curationum, collectus ex libris duobus.

[2] *Bibliotheca Manuscripta ad S. Marci Venetiarum, Codices MSS Latini,* V (1872) 109-10. . . . "medicamina proponuntur ad effectus non tantum physicos sed et morales progignendos. Eiusmodi sunt ad praescienda futurorum;

Treatises on seven, twelve, and nineteen herbs.

The Latin translator of the Kiranides says that it should be preceded by the book of Alexander the Great concerning seven herbs and the seven planets, and by the Mystery of Thessalus to Hermes about twelve herbs for the twelve signs of the zodiac and seven herbs for the seven stars. And in what is left of the preface to the latter treatise in an Erfurt manuscript we are told that after discovering the volumes of the Kyranides the writer found also in the city of Troy the present treatise enclosed in a monument along with the bones of the first king named Kyrannis.[1] The first treatise on seven herbs, however, seems to be more often ascribed in the manuscripts to an Alexius Affricus[2] or Flaccus Africanus[3] than to Alexander the Great.[4] Alexius

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ad fugandos daemones et phantasmata mala; ad naufragium evitandum, dummodo cor focae in arbore navis ligetur; ad sciendum quid mulier egerit in vita sua; ad corpus invisibile reddendum; ad avertendum tempestates, pericula, feras, latrones. Medicaminum autem efficacitas pendet ab eorum confectione vel applicatione, in ortu vel occasu solis, sub augmento aut diminutione lunae, verbis quibusdam prolatis vel lapidibus insculptis."

[1] Amplon. Quarto 217, No. 5, "Post antiquarum kyrannidarum volumina . . . inveni in civitate troiana in monumento reclusum presentem libellum cum ossibus primi regis kyrannis qui compendium aureum intitulatur eo quod per discussionem (or distinctionem?) factam a maiorum kyrannidarum volumine diligenter compilatum et studio vehementi tractat de vii herbis vii planetis attributis secundum illas impressiones." See also Vienna 5289, 15th century, fol. 21, "Tractatus de septem herbis et septem planetis qui dicitur inventus in ciuitate Trojana in monumento primi Regis Kyrani" sive "aureum compendium."

[2] Ashmole 1450, 15th century, fol. 31v, "Incipit quidam tractatus de vii herbis vii planetis attributis. Alexius Affricus, discipulus Belbeis, Claudio Artheniensi epylogiticis studium continuare et finem cum laude. Post etiam antiquorum Kirannidarum volumina"; only the first page of the treatise now remains in this MS.

All Souls 81, 15-16th century, fols. 133v-45, "De virtutibus et operationibus septem herbarum secretarum per ordinem, et quomodo per eas fiunt mirabilia"; the treatise, however, here appears in English and by "Alaxus Affrike, disciple of Robert Claddere of the worthye studie."

CLM 405, 14-15th century, fol. 98, Fracii Africii liber de vii herbis vii planetis attributis.

[3] Amplon. Q. 217, 14th century, fols. 51-54, Incipit tractatus de vii herbis vii planetis attributis Flacti Africani disciputi Belbenis. . . . Glandegrio Atthoniensi epylogitico studium.

Sloane 1754, 14th century, fols. 45-57, "Flacius Affricus discipulus Bellenis Glandigero Atthonensi epilogitico."

Sloane 75, 15th century, fols. 131-2, "Inquit Flaccus Affricanus discipulus Beleni septem sunt herbe."

See also Sloane 73, fols. 4-7; Sloane 3092, 14th century, fols. 2-6.

Berlin 900 (Latin Octavo 42), anno 1510, Compendium aureum des Flaccius Africanus.

[4] Ashmole 1448, 15th century,

or Flaccus seems to address his work to a Claudius or Glandiger of Athens. The work of Thessalus, whose name is sometimes corrupted to Tesalus or Texilus, and whose work is variously styled of twelve or of nineteen herbs, usually is found with the other treatise in the manuscripts.[1] It was one of the authorities acknowledged by Jacobus de Dondis in his *Aggregatio Medicamentorum,* written in 1385.[2] The treatise on seven herbs of Alexander or Flaccus Africanus closes with the direction that the herbs should be gathered from the twenty-first to twenty-seventh day of the moon, with Mercury rising during the entire first hour of the day. As they are plucked, the passion of our Lord should be mentioned, and they should be preserved in barley or wheat. But one manuscript adds, "But do not put credulity in them beyond due measure." [3] We have, of course, already met with similar treatises ascribed to Enoch and Hermes.[4]

Belenus.

The Belenus, as whose disciple Flaccus Africanus is represented, is also the reputed author of a work on astrological images found in several manuscripts of the British Museum.[5] Albertus Magnus in the *Speculum astronomiae* attributed to Belenus two reprehensible books of necromantic images.[6] The *Turba philosophorum,* a medieval work of alchemy consisting in large measure of Latin re-

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pp. 44-45, "Virtutes septem herbarum et septem planetarum secundum Alexandrum imperatorem."

Vienna 3124, 15th century, fol. 49, Alexander is given as the author in the catalogue, but I do not know if the name actually appears in the MS.

[1] Berlin Folio 573, fol. 22, Liber Thesali philosofi de virtutibus 19 herbarum.

Amplon. Quarto 217, #5.

Montpellier 277, 15th century.

Vienna 3124, 15th century, fols. 49-53, Texili, "Liber secretorum de virtutibus 12 herbarum secundum influentiam quam recipiunt a 12 celestibus signis."

Judging by their varying length, I should imagine that some of the MSS listed in the preceding notes contain the Thessalus also.

[2] "Tesalus in secretis de xii herbis per signa celi et de vii secundum planetas."

[3] Digby 147, 14th century, fol. 106.

[4] See above chapters 13, 45.

[5] Royal 12-C-XVIII, 14th century (?), Baleni de imaginibus.

Sloane 3826, 17th century, fols. 100v-101, Liber Balamini sapientis de sigillis planetarum.

Sloane 3848, 17th century, fols. 52-8, 59-62, liber sapientis Balemyn de ymaginibus septem planetarum.

[6] *Opera* ed. Borgnet, X, 641, "Belenus, liber de horarum opere, 'Dixit Belenus qui et Apollo dicitur, imago . . .;' liber de quatuor imaginibus ab aliis sepa-

translation of Arabic versions from Greek alchemists, also cites a Belus or Belinus. The name is believed to be a corruption from Apollonius of Tyana, with whom Apollonius of Perga, the mathematician, is perhaps also confused.[1] One of the *Incipits* of the tracts listed in the *Speculum astronomiae* is, "Said Belenus who is also called Apollo." However, many medieval Latin manuscripts attribute works to Apollonius under that name, as in the case of a work on the Notory Art which we shall mention in another chapter.[2]

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ratis, 'Differentia in qua fiunt imagines magnae. . . .' "

[1] Berthelot (1893) I, 257-8.

[2] See below, chapter 49, pp. 281-3.

CHAPTER XLVII

PRESTER JOHN AND THE MARVELS OF INDIA

Medieval notions of the marvels of India—India's real contribution to knowledge—The legend of Prester John—Miracles of the Apostle Thomas—Otto of Freising on Prester John—Prester John's letter to the Emperor Manuel—Marvels recounted by Prester John—Additional marvels in later versions—The letter of Pope Alexander III—Philip, the papal physician.

Medieval notions of the marvels of India.

In a twelfth century manuscript at Berlin a treatise on precious stones and their medicinal and other marvelous virtues which is ascribed to St. Jerome,[1] opens with a prologue describing a voyage to India, the home of the carbuncle, emerald, and other gems, and the land of mountains of gold guarded by dragons, griffins, and other monsters. According to this prologue the navigation of the Red Sea is extremely dangerous and takes six months, while another full year is required to cross the ocean to India and the Ganges.

India was still a distant land of wonders and home of magic to the minds of medieval men, as it had been in the *Life of Apollonius of Tyana,* and as even to-day many westerners are credulous concerning its jugglers, fakirs, yogis, and theosophists. So William of Auvergne, bishop of Paris, writing in the first half of the thirteenth century, states that feats of magic are very seldom wrought in the Europe of his time. For one thing, as Origen and other early church fathers had already explained, the demons since the coming of Christ to earth had largely ceased their magical activities in Christian lands. But another reason was that the materials for working natural magic, the gems and herbs and animals with marvelous virtues, were seldom found in European lands. In India and other countries adjacent to it, on the contrary, such materials were abundant. Hence natural magic still flourished there and it was a land of many experimenters and of skilful marvel-workers.[1] Similarly Albertus Magnus, discussing the marvelous powers of astrological images, states that the best gems upon which to engrave them are those from India.[2] Costa ben Luca says in his work on physical ligatures that doctors in India are firm believers in the efficacy of incantations and adjurations; and about 1295 Peter of Abano speaks in his *Phisionomia* of the wise men of India as prolix on astrological themes. Medieval geomancies, too, often claim a connection with India.[3]

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[1] Berlin 956, 12th century, fols. 24-25.

India's real contribution to knowledge.

It should also be kept in mind, however, that medieval men believed that they derived from India learning which seems to us even to-day as sound and useful as it did to them then; for example, the Hindu-Arabic numerals.[4] Leonardo of Pisa, the great arithmetician of the early thirteenth century, tells us in the preface to his *Liber Abaci*[5] how, summoned as a boy to join his father who was a customs official at a trading station in Algeria, he was introduced to the art of reckoning "by a marvelous method through the nine figures of the Indians." Thus we see that India's marvels were not always false. Later he traveled in Egypt, Syria, Greece, Sicily, and Provence and studied their various methods of reckoning, but vastly preferred the Indian method to all others, returned to a more intensive study of it, and developed it further by additions from Euclid and contributions of his own. Not always, it is true, were medieval mathematicians as favorable to Indian methods as this. Jordanus Nemorarius in one passage characterizes an Indian theorem as "nothing but mere credulity without demonstration." [1] But to return to the natural marvels of India.

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[1] *Gulielmi Alverni . . . Opera Omnia*, 1591, p. 1003, *De universo*, II, iii, 23.

[2] *Mineral.* II, iii, 4.

[3] One condemned at Paris in 1277 began, "The Indians have believed . . ." ; two in a Harleian MS 2404 are called *Indeana;* a third, part Latin and part French, in Sloane MS 314 of the 15th century, opens, "This is the Indyana of Gremmgus which is called the daughter of astronomy and which one of the sages of India wrote." See also CU Magdalene 27 (F. 4. 27, Haenel 23), late 14th century, fols. 72-88, "Hec est geomentia Indiana que vocatur filia Ast . . . quam fecit unius (*sic*) sapientum Indie. . . ."

[4] See D. E. Smith and L. C. Karpinski, *The Hindu-Arabic Numerals,* Boston, 1911; S. R. Benedict, *A Comparative Study of the Early Treatises introducing into Europe the Hindu Art of Reckoning,* Concord, 1914; L. C. Karpinski, "Two Twelfth Century Algorisms," *Isis,* III (1921) 396-413. For "newly discovered evidence showing that the Hindu numerals were known to and justly appreciated by the Syrian writer Severus Sebokht, who lived in the second half of the seventh century," see F. Nau in *Journal asiatique,* 1910, and J. Ginsburg, "New Light on our Numerals," in the *Bulletin of the American Mathematical Society,* XXIII (1917) 366-9. On the question of the debt of Arabic algebra to India, especially in the case of Muhammad. b. Musa al-Hwarazmi, who was also an astrologer, see J. Ruska *Zur ältesten arabischen Algebra und Rechenkunst,* in *Sitzb. d. Heidelberger Akademie d. Wiss. Philos. hist. Klasse,* 1917.

[5] *Scritti di Leonardo Pisano,* vol. I, 1857.

The legend of Prester John.

In the extraordinary accounts of Prester John,[2] which are first met in the twelfth century and were added to with succeeding centuries and which had great currency from the start, as the number of extant manuscripts shows, the natural marvels of India vie in impressiveness and wonderment with the power of Prester John himself and with the miracles of the Apostle Thomas.

Miracles of the Apostle Thomas.

Odo, Abbot of St. Rémy from 1118 to 1151, states in a letter in response to the inquiry of a Count Thomas what had happened when he was recently in Rome. Byzantine ambassadors introduced to the pope an archbishop of India who had already had the extraordinary and disconcerting experience of having to return a third time to Constantinople for a new prince for his country, each previous Byzantine nominee having died on his hands. This archbishop said that the body of the Apostle Thomas was preserved in his country in a church rich in treasure and ornaments and surrounded by a river fordable only at the time of the saint's festival. On that solemn occasion the Apostle's body was shown to believers and the Apostle would raise his arm and open his hand to receive their gifts, but close it and refuse to receive any gift offered by a heretic. When this tale reached the pope's ears he forbade the archbishop to disseminate such falsehoods further under pain of anathema, but the archbishop finally convinced the pope by taking an oath on the holy gospels.

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[1] *Jordani Nemorarii Geometria vel De triangulis libri IV*, ed. M. Curtze, Thorn, 1887, pp. 43-44.

[2] A good brief summary of the results of d'Avezac, Zarncke, and others will be found in Sir Henry Yule's article on "Prester John," EB. For the various texts to be here considered, with later interpolations and additions distinguished, see Friedrich Zarncke, *Der Priester Johannes*, in *Abhandl. d. Kgl. Sächs. Gesells. d. Wiss.* VII (1879), 627-1030; VIII (1883) 1-186.

Another longer and anonymous account has come down from manuscripts going back to the twelfth century of the visit of a Patriarch John of India to Rome under Pope Calixtus II (1119-1124). It is this account which is often joined in the manuscripts and early printed editions with the *Letter of Prester John* of which we shall presently speak. In this account the Patriarch John told "of memorable matters of his Indian region that were unknown to the Romans," such as of the gold and gems in the river Physon which flows from Paradise, "but especially of the miracles of the most holy Apostle Thomas." Without going into further details, such as that of the miraculous balsam lamp, which differ a good deal from Odo's account, it may be noted that in this account the Apostle's hand ministers the Eucharist to believers and refuses it to infidels and sinners.

Otto of Freising on Prester John, the descendant of the Magi.

We have progressed from an archbishop of India to a Patriarch John; we now come to Prester John the monarch. The historian, Otto of Freising, learned in 1145 from a Syrian bishop at Rome of a great victory recently gained over the Moslems by "a certain John who lived beyond Persia and Armenia in the extreme East, a king and priest, since he was a Christian by race but a Nestorian . . . Prester John, for so they are wont to call him." He was of the ancient progeny of the Magi mentioned in the Gospel, ruled the same races as they, and enjoyed such glory and abundance that he was said to use only an emerald scepter. After his victory he would have come to the aid of the crusaders at Jerusalem, but could not cross the Tigris, although he marched north along its eastern bank and waited for some years in the hope that it would freeze over.[1]

Prester John's letter to the Emperor Manuel.

This Prester John was to be heard from again, however, for in the same century there appeared a letter purporting to have been written by him to the Byzantine Emperor, Manuel (1143-1180).[2] It is in this letter that the natural and artificial marvels of India and adjacent territories—Prester John's dominion reaches from farther India to the Babylonian desert—are especially recorded. This letter even in its earliest and briefest form seems without doubt a western forgery and bears the marks of its Latin origin,[3]

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[1] In Yule (1903) I, 231-7, Cordier discusses whether this monarch was Gurkhan of Kara Khitai (as urged by d'Avezac and Oppert) who "in 1141 came to the aid of the King of Khwarizmi against Sanjar, the Seljukian sovereign of Persia, . . . and defeated that prince with great slaughter," or whether he was "John Orbelian . . . for years the pride of Georgia and the hammer of the Turks" (as urged by Professor Bruun of Odessa).

[2] For its text, with interpolations distinguished from the original text, see Zarncke (1879) 909-924. Some of the passages which Zarncke regards as interpolations are, however, already found in 12th century MSS. On the other hand, his text does not include all the interpolations and variations to be found even in the MSS which he describes. For instance, in BN 6244A, fol. 130r, just before the description of the herb *assidios*, occurs a passage which may be translated as follows: "You should know also that in our country we do not need doctors, for we have precious stones, herbs, fountains, and trees of so great virtue that they prevail against every infirmity and against poisons and wounds. And we have books which instruct us and distinguish between the potencies and virtues of the herbs." In this MS Prester John is also more voluble on the theme of his devotion to the Christian faith than appears in Zarncke's text, and (fols. 127v-128r) repeats the story of the administration of the Eucharist by the hand of the body of the Apostle Thomas. Zarncke lists about one hundred MSS of the letter but fails to use or mention any of those in the Bodleian Library where, for instance, Digby 158, fols. 2r-5v, is of the twelfth century. Another twelfth century MS not in his list is Paris Arsenal 379A, fol. 34. Zarncke also does not list the MSS of the letter at Madrid and Wolfenbüttel.

[3] In many MSS. nothing is said of its being a translation or when or by whom it was translated; others state that it was translated into Greek and Latin, or, in at least one case, from Arabic into Latin. Only from the thirteenth century on, I think, is Christian, Archbishop of Mainz, sometimes said to have translated it from Greek into Latin. Often it is simply stated that Manuel transmitted the letter to the Emperor Frederick, to whom also it is sometimes represented as sent direct by Prester John. Sometimes it is to the Pope to whom the letter comes from Manuel or Prester John.

The statement that Manuel transmitted the letter to the Emperor Frederick makes one wonder whether Anselm, Bishop of Havelberg and later of Ravenna, since despite the use of a few Greek ecclesiastical and official terms [1] and the attempt to rehearse unheard-of wonders, the writer indulges in a sneer at Greek adoration of the emperor [2] and is unable to conceive of Prester John except as a feudal overlord [3] with the usual kings, dukes and counts, archbishops, bishops and abbots under him. The letter then is of value chiefly as showing us what ideas prevailed concerning India and the orient in the Latin world of the twelfth and succeeding centuries, for the letter received many additions and variations, was translated into the vernacular languages, and appeared in print before 1500.[4] In the following account of its contents, however, I shall try to describe the letter as it existed in the twelfth century, after which I shall mention what seem to be interpolations of the thirteenth or later centuries.

Marvels recounted by Prester John.

But while different copies of the work vary, all have the same general character. Prester John tells what a mighty and Christian potentate he is and describes his marvelous palaces and contrivances or the natural marvels, strange beasts and serpents, monstrous races of men, potent herbs, stones, and fountains, to be found in the lands owning his sway. In one province is the herb *assidios* which enables its bearer to rout an impure spirit and force him to

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can have had anything to do with it. He was sent by Frederick on an embassy to Manuel in 1153, which seems to identify him with the author of a *"Liber de diversitate nature et persone proprietatumque personalium non tam Latinorum quam ex Grecorum auctoritatibus extractus"* — CUL 1824 (Qi. vi. 27), beautiful 13th century hand, fols. 129-76,—who states in his preface that he collected his Greek authorities in Constantinople where he was sent by Frederick on an embassy to Manuel, and on his return to Germany showed them to *Petro venerabili Tusculano episcopo*."

[1] Such as Apocrisarius and Archimandrite, a word however not entirely unknown in the west; see Ducange.

[2] "Cum enim hominem nos esse cognoscamus, te Graeculi tui Deum esse existimant, cum te mortalem et humanae corruptioni subiacere cognoscamus," Zarncke (1879) 910.

[3] For instance, the writer twice alludes to the square before Prester John's palace where he watches the combatants in judicial duels or wager of battle, Zarncke (1879) 918, 919.

[4] I have seen a copy in the British Museum (IA. 8685), *De Mirabilibus Indiae*, where the account given Calixtus II of miracles of the Apostle Thomas is run together with the letter of Prester John.

disclose his name and whence he comes. "Wherefore impure spirits in that land dare not take possession of anyone." [1] A fountain flows from Mount Olympus not three days' journey from Paradise whence Adam was expelled. Three draughts from it taken fasting insure one henceforth from all infirmity, and however long one may live, one will seem henceforth but thirty years of age.[2] Then there are some little stones which eagles often bring to Prester John's territories and which worn on the finger preserve or restore the sight, or if consecrated with a lawful incantation, make one invisible and dispel envy and hatred and promote concord.[3] After a description of a sea of sand in which there are various kinds of edible fish and a river of stones, Prester John soon mentions the worms which in his language are called salamanders, who cannot live except in fire, and from whose skins he has robes made which can be cleansed only by fire.[4] After some boasting concerning the absence of poverty, crime, and falsehood in his country and about the pomp and wealth with which he goes forth to war, Prester John then comes to the description of his palace, which is similar to that which the Apostle Thomas built for Gundaphorus, King of India. Its gates of sardonyx mixed with *cornu cerastis* (horn of the horned serpents) prevent the secret introduction of poison; a couch of sapphire keeps

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[1] Zarncke, 912; Digby 158, fol. 2v; BN 2342, fol. 191v; BN 3359, fol. 144v.

[2] Zarncke, 912-913; MSS as before. This fountain of youth was little improved upon by another inserted later (Zarncke, 920-21; BN 3359, fol. 146v; not in the other two MSS), which one had to taste thrice daily on a fasting stomach for three years, three months, three weeks, three days, and three hours, in order to live and remain youthful for three hundred years, three months, three weeks, three days, and three hours.

[3] Zarncke, 913; Digby 158, fol. 3r, etc.

[4] Zarncke, 915; Digby 158, fol. 3v; BN 2342, fol. 192r; BN 3359, fol. 145r. It will be recalled that Charlemagne is said to have had such a garment. Pliny discussed both salamanders and asbestos but did not connect the two. Marco Polo, however, says (I 42, Yule (1903) I, 212-3), "The real truth is that the salamander is no beast, as they allege in our part of the world, but is a substance found in the earth. . . . Everybody must be aware that it can be no animal's nature to live in fire, seeing that every animal is composed of all four elements." Polo confirms, however, the report of robes made of incombustible mineral fibre and cleansed by fire.

John chaste; the square before the palace where judicial duels are held is paved with onyx "in order that the courage of the fighters may be increased by the virtue of the stone." [1] Near this square is a magic mirror which reveals all plots in the provinces subject to Prester John or in adjacent lands.[2] In some manuscripts of the twelfth century is a description of another palace which before Prester John's birth his father was instructed in a dream to build for his son. One feature of it is that no matter how hungry one may be on entering it, he always comes out feeling as full as if he had partaken of a sumptuous banquet.[3]

Additional marvels in later versions.

To such marvels in the early versions of the *Letter of Prester John* were added others in the course of the thirteenth century and later middle ages:—the huge man-eating ants who mined gold by night; [4] the land where men lived on manna, a substance which we shall find somewhat similarly mentioned by Michael Scot and Thomas of Cantimpré; [5] the tale, which we shall also hear from Roger Bacon, of men who tame flying dragons by their incantations and magic, saddle and bridle them, and ride them through the air; [6] the five marvelous stones that froze or heated or reduced to an even state of temperature or made light or dark everything within a radius of five miles; the second five stones, of which two were unconsecrated and turned water to milk or wine, while three were consecrated and would respectively cause fish to congregate, wild beasts to follow one, and, sprinkled with hot lion's blood, produce a conflagration which could only be quenched by sprinkling the stone with hot dragon's blood; [7] the marvelous mill operated by the occult virtue of the stone adamant; [8] the wonderful tree on which the wonderful healing apple grew;[1] the marvelous chapel of glass, always just big enough for as many persons as entered it;[2] and the stone and the fountain that served as fireless heaters.[3] In another case a marvel is wrought by stone and fountain combined. Two old men guard a large stone and admit to its hollow only Christians or those who desire to become Christians. If this profession of faith is genuine, the water in the hollow which is usually only four fingers deep thrice rises above the head of the person admitted, who thereupon emerges recovered from all sickness.[4]

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[1] Zarncke, 918; Digby 158, fol. 4r; BN 2342, fol. 192r; BN 3359, fol. 145v.

[2] Zarncke, 919-20; Digby 158, fols. 4v-5r; BN 2342, fol. 192v; BN 3359, fol. 146r.

[3] Zarncke, 920-22; Digby 158 fol. 5v; BN 2342, fol. 192v; BN 3359, fol. 146r-v.

[4] Zarncke, 911.

[5] *Ibid.*, 913. For Michael Scot, see Chapter 51, page 324; for Thomas of Cantimpré, Chapter 53, page 393.

[6] Zarncke, 913. For Roger Bacon, see Chapter 61, page 657.

[7] Zarncke, 915-16.

[8] *Ibid*, 918-19.

The letter of Pope Alexander III.

How real Prester John was to the men of the twelfth century may be seen from the fact that Pope Alexander III on September 27, 1177, addressed from the Rialto in Venice a letter to him or to some actual eastern potentate whom he had confused with him.[5] The Pope does not expressly mention Prester John's letter to Manuel but says that he has heard of him from many persons and common report, and more especially from "Master Philip, our friend and physician," who had talked "with great and honourable men of your kingdom," by whom he had been informed of their ruler's desire for a church and altar at Jerusalem. It is this Philip whom the Pope now sends with his letter to Prester John and to instruct him in the doctrine of the Roman church. But it is a long and laborious journey involving many hardships and vicissitudes and the traversing of many countries with barbarous and unknown languages.

Philip, the papal physician.

Whether Philip ever succeeded in delivering the letter is not known and he has himself been regarded as a mysterious personage of whom nothing further was known.[6] I would suggest, however, that, as he seems to have been conversant with Syria and the Holy Land, he may have been the Philip of whose translation of the *Secret of*

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[1] Zarncke, 921.

[2] *Ibid.*, 922.

[3] *Ibid.*, 923.

[4] *Ibid.*, 914.

[5] Text of the letter in Zarncke, 941-44.

[6] Zarncke, 945, "Der Philippus, den der Papst seinen familiaris nennt, ist bis jetzt nicht nachgewiesen."

Secrets of the Pseudo-Aristotle we shall treat in the next chapter, a work which he found in Antioch and dedicated to the bishop of Tripoli. Or, if we do not meet this particular Philip again, we shall find in close relations with other popes other physicians whose names are prominent in the natural and occult science of the age.

CHAPTER XLVIII

THE PSEUDO-ARISTOTLE

Alexander and Aristotle—Spurious writings ascribed to Aristotle—Aristotle and experiment—Aristotle and alchemy: *Meteorology* and *On colors*—Works of alchemy ascribed to Aristotle—Aristotle and Alexander as alchemists—Aristotle and astrology—Astrology and magic in the *Theology* and *De Pomo* of Aristotle—*Liber de causis proprietatum elementorum et planetarum*—Other astrological treatises ascribed to Aristotle—Aristotle and 250 volumes of the Indians—Works on astrological images—And on necromantic images—Alexander as an astrologer—Aristotle and spirits—*On plants* and the *Lapidary*—Virtues of gems—Stories of Alexander and of Socrates—Alexander's submarine—Arabian tales of Alexander—A magic horn—More stories of Alexander and gems—Story of Alexander's belt—The royal *Lapidary* of Wenzel II of Bohemia—*Chiromancy* and *Physiognomy* of Aristotle—*The Secret of Secrets*—Its textual history—The Latin translations of John of Spain and Philip—Philip's preface—Prominence of occult science—Absence of mysticism—Discussion of kingship—Medical discussion—Astrology—Story of the two boys—Virtues of stones and herbs, incantations and amulets—Thirteenth century scepticism—Number and alchemy—The poisonous maiden—The Jew and the Magus.

Alexander and Aristotle.

In a previous chapter we have seen what a wide currency the legend of Alexander had both in east and west in the later Roman Empire and early middle ages, and how with Alexander was associated the magician and astrologer Nectanebus. We also saw that by about 800 A. D. at least a separate Letter of Alexander to Aristotle on the Marvels of India was current in the Latin west, and in the present chapter it is especially to the Pseudo-Aristotle and his connection with Alexander and India, rather than to the Pseudo-Callisthenes, that we turn. The tremendous historical importance of the career of Alexander the Great and of the writings of Aristotle impressed itself perhaps even unduly upon both the Arabian and the medieval mind. The personal connection between the two men—Aristotle was for a time Alexander's tutor—was seized upon and magnified. Pliny in his *Natural History* had stated that Alexander had empowered Aristotle to send two thousand men to different parts of the world to test by experience all things on the face of the earth.[1] This account of their scientific co-operation was enlarged upon by spurious writings associated with their names like the letter on the marvels of India.[2] With the introduction into western Europe in the twelfth and early thirteenth centuries of many genuine works of Aristotle unknown to the early middle ages, which had possessed only certain of his logical treatises, there also came into circulation a number of spurious writings ascribed to him.

Spurious writings ascribed to Aristotle.

It is not surprising that many spurious works were attributed to Aristotle in the middle ages, when we remember that his writings came to them for the most part indirectly through corrupt translations, and that some writing from so great a master was eagerly looked for upon every subject in which they were interested. It seemed to them that so encyclopedic a genius must have touched on all fields of knowledge and they often failed to realize that in Aristotle's time the departments of learning had been somewhat different from their own and that new interests and doctrine had developed since then. There was also a tendency to ascribe to Aristotle any work of unknown or uncertain authorship. At the close of the twelfth century Alexander Neckam[3] lists among historic instances of envy Aristotle's holding back from posterity certain of his most subtle writings, which he ordered should be buried with him. At the same time he so guarded the place of his sepulcher, whether by some force of nature or power of art or prodigy of magic is uncertain, that no one has yet been able to approach it, although some think that Antichrist will be able to inspect these books when he comes. Roger Bacon in the thirteenth century believed that Aristotle had written over a thousand works and complained bitterly because certain treatises, which were probably really apocryphal, had not been translated into Latin.[1] Indeed, some of the works ascribed to Aristotle in the Oriental and Mohammedan worlds were never translated into Latin, such as the astrological *De impressionibus coelestibus* which Bacon mentions, or the Syriac text which K. Ahrens edited in 1892 with a German translation as "Das Buch der Naturgegenstände"; or first appeared in Latin guise after the invention of printing, as was the case with the so-called *Theology* of Aristotle,[2] a work which was little more than a series of extracts from the *Enneads* of Plotinus.[3] Some treatises attributed to Aristotle in medieval Latin do not bear especially upon our investigation, such as *Grammar* which Grosseteste is said to have translated from Greek.[4]

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[1] See Roger Bacon's allusion to this passage in F. A. Gasquet, "An Unpublished Fragment of a Work by Roger Bacon," in EHR, XII (1897), p. 502.

[2] Ch. Gidel, *La Légende d'Aristote au moyen âge,* in *Assoc. des Études Grecques,* (1874), pp. 285-332, except for the Pseudo-Callisthenes uses only the French vernacular literature or popular legends concerning Aristotle. Similar in scope is W. Hertz, *Aristoteles in den Alexanderdichtungen des Mittelalters,* in *Abhandl. d. philos-philol. Classe d. k. bayr. Akad. d. Wiss.,* XIX (1892) 1-103; revised in W. Hertz, *Gesammelte Abhandlungen,* 1905, 1-155.

[3] *De naturis rerum,* II, 189.

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[1] *Compendium Studii Philosophiae,* ed. Brewer, (1859), p. 473.

[2] It was translated into Arabic about 840 A. D.; an interpolated Latin paraphrase of it was published at Rome in 1519, by Pietro Niccolo de' Castellani,—*Sapientissimi Aristotelis Stagiritae Theologia sive mistica philosophia, secundum Aegyptios noviter reperta et in latinam castigatissime redacta;* a French version appeared at Paris in 1572 (Carra de Vaux, *Avicenne,* p. 74). F. Dieterici translated it from Arabic into German in 1883, after publishing the Arabic text for the first time in 1882. For divergences between this Arabic text and the Latin one of 1519, and citation of Baumgartner that the *Theology* was known in Latin translation as early as 1200, see Grabmann (1916), pp. 245-7.

[3] Indeed Carra de Vaux, *Avicenne,* p. 73, says, "Tout un livre qui ne contient en réalité que des extraits des Ennéades IV à VI de Plotin."

[4] See Arundel MS 165, 14th century. On the general subject of the Pseudo-Aristotelian literature the reader may consult V. Rose, *Aristoteles Pseudepigraphus,* and *De ordine et auctoritate librorum Aristotelis;* Munk's article "Aristote" in *La France littéraire;* Schwab, *Bibliographie d'Aristote,* Paris, 1896; and R. Shute, *History of the Aristotelian Writings,* Oxford, 1888. It is, however, a difficult subject and for the middle ages at least has not been satisfactorily investigated. Grabmann (1916) devotes only a page or two of supplement to it; see pp. 248-51. A work on Aristotle in the middle ages, an-

Aristotle and experiment.

For our purposes the Pseudo-Aristotelian writings may be sub-divided under seven heads: experiment, alchemy, astrology, spirits, occult virtues of stones and herbs, chiromancy and physiognomy, and last the famous *Secret of Secrets*. Under the first of these heads may be put a treatise on the conduct of waters, which consists of a series of experiments in siphoning and the like illustrated in the manuscript by lettered and colored figures and diagrams.[1] In a Vatican manuscript it is perhaps more correctly ascribed to Philo of Byzantium.

Aristotle and alchemy: *Meteorology* and *On colors*.

From experiment to alchemy is an easy step, for the alchemists experimented a good deal in the period which we are now considering. The fourth book of the *Meteorology* of Aristotle, which, if not a genuine portion of that work, at least goes back to the third century before Christ,[2] has been called a manual of chemistry,[3] and apparently is the oldest such extant. Its doctrines are also believed to have been influential in the development of alchemy; and there were passages in this fourth book which led men later to regard Aristotle as favorable to the doctrine of the transmutation of metals. Gerard of Cremona had translated only the first three books of the *Meteorology;* the fourth was supplied from a translation from the Greek made by Henricus Aristippus who died in 1162; to this fourth book were added three chapters translated by Alfred of England or of Sareshel from the Arabic,[4] apparently of Avi-

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nounced in 1904 by G. H. Luquet, seems not to have appeared.

[1] Sloane 2030, fols. 110-13.

[2] Hammer-Jensen, *Das sogenannte IV Buch der Meteorologie des Aristoteles*, in *Hermes,* vol. 50 (1915) pp. 113-36, argues that its teachings differ from those of Aristotle and assigns it to Strato, his younger contemporary. Not content with this thesis, which is easier to suggest than to prove, Hammer-Jensen contends that it was a work of Strato's youth and that it profoundly influenced Aristotle himself in his last works. "The convenient Strato!" as he is called by Loveday and Forster in the preface to their translation of *De coloribus* (1913) vol. VI of *The Works of Aristotle* translated into English under the editorship of W. D. Ross.

[3] So Hammer-Jensen, p. 113, and earlier Heller (1882), I, 61.

[4] Nürnberg Stadtbibliothek (centur. V, 59, membr. 13th century)—cited by Rose, *Hermes* I, 385—"Completus est liber metheororum cuius tres primos libros transtulit magister Gerardus Lumbardus summus philosophus de arabico in latinum. Quartum autem transtulit Henricus Aristippus de greco

cenna.[1] These additions of Alfred from Avicenna discussed the formation of metals but attacked the alchemists.[2] Vincent of Beauvais [3] and Albertus Magnus [4] were both aware, however, that this attack upon the alchemists was probably not by Aristotle. The short treatise *On colors,*[5] which is included in so many medieval manuscript collections of the works of Aristotle in Latin,[6] by its very title would suggest to medieval readers that he had been interested in the art of alchemy, although its actual contents deal only in small part with dyes and tinctures. Its form and contents are not regarded as Aristotle's, but it was perhaps by someone of the Peripatetic school. Thus works which, if not by Aristotle himself, at least had been written in Greek long before the medieval period, gave medieval readers the impression that Aristotle was favorable to alchemy.

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in latinum. Tria ultima capitula transtulit Aluredus Anglicus sarelensis de arabico in latinum."

Steinschneider (1893) pp. 59 and 84; (1905) p. 7; and others, including Hammer-Jensen, give the name of the translator of the fourth book from the Greek as Hermann and of the last three chapters as Aurelius, whom Steinschneider is more correct in describing as "otherwise unknown." On the other hand, we know that Aristippus and Alfred translated other Aristotelian treatises. Evidently Steinschneider and the others have followed MSS where the copyist has corrupted the proper names.

[1] Steinschneider and Hammer-Jensen quote from MSS, "tria vero ultima Avicennae capitula transtulit Aurelius de arabico in latinum." Albertus Magnus, *Mineral,* III, i, 9, also ascribed the passage to Avicenna; others have suggested that it is by disciples of Avicenna. See J. Wood Brown (1897) pp. 72-3, for a similar passage from Avicenna's *Sermo de generatione lapidum.*

[2] They were printed at Bologna, 1501, as *Liber de mineralibus Aristotelis* and also published, sometimes as Geber's, sometimes as Avicenna's, under the title, *Liber de congelatione.*

BN 16142 contains a Latin translation of the four books of the *Meteorology* with an addition dealing with minerals and geology which is briefer than the printed *Liber de mineralibus Aristotelis,* omitting the passage against the alchemists: published by F. de Mély, *Rev. des Études grecques,* (1894), p. 185 *et seq.* (cited Hammer-Jensen, 131).

[3] *Speculum naturale,* VIII, 85.

[4] See note 1 above.

[5] Greek text by Prantl, Teubner, 1881; English translation by Loveday and Forster, 1913. See also Prantl, *Aristoteles über die Farben,* 1849.

[6] Just a few examples are: Mazarine 3458 and 3459, 13th century; 3460 and 3461, 14th century; Arsenal 748A, 15th century, fol. 185; BN 6325, 14th century, #1; BN 14719, 14-15th century, fol. 38-; BN 14717, end 13th century; BN 16633, 13th century, fol. 102-; S. Marco X, 57, 13th century, beautifully illuminated, fols. 312-17; Assisi 283, 14th century, fol. 289-; Volterra 19, 14th century, fol. 196-.

Works of alchemy ascribed to Aristotle.

It is therefore not surprising that works of alchemy appeared in medieval Latin under Aristotle's name. The names of Plato and Aristotle had headed the lists of alchemists in Greek manuscripts although no works ascribed to Aristotle have been preserved in the same.[1] Berthelot, however, speaks of a pseudo-Aristotle in Arabic,[2] and in an Oxford manuscript of the thirteenth century under the name of Aristotle appears a treatise *On the twelve waters of the secret river* said to be "translated from Arabic into Latin." [3] In the preface the author promises that whoever becomes skilled, adept, and expert in these twelve waters will never lose hope nor be depressed by want. He regards this treatise as the chief among his works, since he has learned these waters by experiment. They are all chemical rather than medical; a brief "chapter" or paragraph is devoted to each. In another manuscript at the Bodleian two brief tracts are ascribed to Aristotle; one describes the seven metals, the other deals with transmutation.[4] In a single manuscript at Munich both a theoretical treatise in medicine and alchemy and a *Practica* are attributed to Aristotle, and in two other manuscripts he is credited with the *Book of Seventy Precepts* which sometimes is ascribed to Geber.[5] Thomas of

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[1] Berthelot (1885) p. 143, "Platon et Aristote sont mis en tête de la liste des alchimistes œcuméniques sans qu' aucun ouvrage leur soit assigné."

[2] Berthelot (1888) I, 76; citing Manget, *Bibl. Chemica,* I, 622.

[3] Digby 162, 13th century, fols. 10v-11v, "Incipit liber Aristotelis de aquis secreti fluminis translatus ab arabico in latinum." In the margin the twelve waters are briefly designated: 1 *rubicunda,* 2 *penetrativa,* 3 *mollificativa, et ingrediente,* 4 *de aqua eiusdem ponderis et magnitudinis,* 5 *ignita,* 6 *sulphurea,* 7 *aqua cineris,* 8 *aurea,* etc. In one or two cases, however, these heads do not quite apply to the corresponding chapters.

[4] Ashmole 1448, 15th century, pp. 200-202, de "altitudinibus, profundis, lateribusque" metallorum secundum Aristotelem (name in the margin). It opens, "Plumbum est in altitudine sua ar. nigrum." It takes up in turn the *altitudo* of each metal and then discusses the next quality in the same way.

Ibid., pp. 239-44, opens, "Arestotilus, Cum studii, etc. Scias preterea quod propter longitudines"; at p. 241 it treats "de purificatione solis et lune" (*i.e.,* gold and silver); at p. 243, "de separatione solis et lune." It ends with a paragraph about the composition of a golden seal.

[5] CLM 12026, 15th century, fol. 46-, "Alchymia est ars docens. . . . / . . . Explicit dicto libri (*sic*) Aristotelis de theorica in rebus naturalibus"; fol. 78, Liber Aristotelis de practica summae philoso-

Cantimpré cites Aristotle in the *Lumen luminum* as saying that the best gold is made from yellow copper ore and the urine of a boy, but Thomas hastens to add that such gold is best in color rather than in substance.[1] The translation of the *Lumen luminum* is ascribed both to Michael Scot and brother Elias.[2] Aristotle is quoted several times in *De alchimia,* ascribed to Albertus Magnus, but only in the later "Additions" to it, where Roger Bacon also is cited, is the specific title *Liber de perfecto magisterio* given as Aristotle's.[3] Sometimes works of alchemy were very carelessly ascribed to Aristotle, when it is perfectly evident from the works themselves that they could not have been written by him.[4]

Aristotle and Alexander as alchemists.

The alchemical discoveries and writings ascribed to Aristotle are often associated in some way with Alexander the Great as well. In one manuscript John of Spain's translation of the *Secret of Secrets* is followed by a description of the virtues and compositions of four stones "which Aristotle sent to Alexander the Great." [5] It seems obvious that these are philosopher's stones and not natural gems. The *Liber ignium* of Marcus Grecus, composed in the thirteenth or early fourteenth century, ascribes to Aristotle the discovery of two marvelous kinds of fires. One, which he discovered while traveling with Alexander the king, will burn for a year without cessation. The other, in the composition of which observance of the dog-days is requisite, "Aristotle

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phiae, "Primo de separatione salis communis. . . ."

CLM 25110, 15th century, fols. 211-45, Liber Aristotelis de 70 preceptis.

CLM 25113, 16th century, fols. 10-28, A. de alchimia liber qui dicitur de 70 preceptis.

[1] Egerton 1984, fol. 141v; in the *De natura rerum.*

[2] See Chapter 51 on Michael Scot, near the close.

[3] Caps. 22 and 57. It was printed with further "Additions" of its own in 1561 in *Verae alchemiae artisque metallicae citra aenigmata,* Basel, 1561, II, 188-225.

[4] Thus in *Auriferae artis quam chemiam vocant antiquissimi authores,* Basel, 1572, pp. 387-99, a treatise which cites Morienus, Rasis, and Avicenna is printed as *Tractatulus Aristotelis de Practica lapidis philosophici.* Apparently the only reason for ascribing it to Aristotle is that it cites "the philosopher" in its opening sentence, "Cum omne corpus secundum philosophum aut est elementum aut ab elementis generatum."

[5] Laud. Misc. 708, 15th century, fol. 54.

asserts will last for nine years." [1] A collection of chemical experiments by a Nicholas, of whom we shall have more to say in a later chapter, gives "a fire which Aristotle discovered with Alexander for obscure places." [2] A letter of Aristotle to Alexander in a collection of alchemical tracts is hardly worth noting, as it is only seven lines long, but it is interesting to observe that it cites Aristotle's *Meteorology*.[3] Perhaps by a mistake one or two alchemical treatises are ascribed to Alexander rather than Aristotle.[4]

Aristotle and astrology.

Aristotle's genuine works give even more encouragement to the pretensions of astrology than to those of alchemy. His opinion that the four elements were insufficient to explain natural phenomena and his theory of a fifth essence were favorable to the belief in occult virtue and the influence of the stars upon inferior objects. In his work on generation [1] he held that the elements alone were mere tools without a workman; the missing agent is supplied by the revolution of the heavens. In the twelfth book of the *Metaphysics* he described the stars and planets as eternal and acting as intermediaries between the prime Mover and inferior beings. Thus they are the direct causes of all life and action in our world. Charles Jourdain regarded the introduction of the *Metaphysics* into western Europe at the opening of the thirteenth century as a principal cause for the great prevalence of astrology from that time on, the other main cause being the translation of Arabian astrological treatises.[2] Jourdain did not duly appreciate the great hold which astrology already had in the twelfth century, but it is nevertheless true that in the new Aristotle astrology found further support.

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[1] Berthelot (1893), I, 105 and 107.

[2] Ashmole 1448, 15th century, p. 123.

[3] Ashmole 1450, 15th century, fol. 8, "Epistola ad Alexandrum. O Alexander rector hominum . . . / . . . et audientes non intelligant."

Harleian 3703, 14th century, fols. 41r-42r, Aristoteles ad alexandrum. "In primo o elaxandor tradere tibi volo secretorum maximum secretum . . .," is a similar treatise.

[4] Ashmole 1384, mid 14th century, fols. 91v-93r, "Incipit Epistola Allexandri. Dicunt philosophi quod ars dirivata sit ex creatione hominis cui omnia insunt . . . / . . . ex omni specie et colore nomine. Explicit epistola Alexandri." In the text itself, which is written in the manner of a master to a disciple, there is nothing to show that the work is by Alexander rather than Aristotle.

The following is apparently the same treatise but the closing words are different.

Riccard. 1165, 15th century, fols. 161-3, Liber Alexandri in scientia secretorum nature. "Dicitur quod hec ars derivata sit ex creacione hominis cui omnia insunt . . . / . . . et deo annuente ad optatum finem pervenies."

The next would seem to be another treatise than the foregoing.

Arezzo 232, 15th century, fols 1-14, "Liber transmissus ab Alexandro rege ex libro Hermogenis."

Hermogenes, who is cited on the subject of the philosopher's stone in at least one MS of the *Secret of Secrets* (Bodleian 67, fol. 33v, "Et pater noster Hermogenes qui triplex est in philosophia optime philosophando dixit"), is apparently none other than Hermes Trismegistus. He is also mentioned in a brief work of Aristotle to Alexander; Harleian 3703, 14th century, fols. 41r-42r," . . . hermogenes quod (*sic*) egypti multum commendunt et laudant et sibi attribuant omnem scientiam secretam et celerem (?)." The use of the reflexive pronoun in this sentence to refer to Hermogenes I would have the reader note, as it appears to illustrate a fairly common medieval usage which has or will lead me to alter the translations which have been proposed for certain other passages.

Astrology and magic in the *Theology* and *De pomo* of Aristotle.

Astrology crops out here and there in most of the spurious works extant under Aristotle's name, just as it does in medieval learning everywhere. One section of a dozen pages in the *Theology* discusses the influence of the stars upon nature and the working of magic by making use of these celestial forces and the natural attraction which things have for one another. It regards artificial magic as a fraud but natural and astrological magic as a reality. However, as in the original text of Plotinus which the *Theology* follows, it is only the animal soul which is affected by magic and the man of impulse who is moved thereby; the thinking man can free himself from its influence by use of the rational soul. In the treatise, *De pomo*,[3] which seems not to have been translated into Latin until the thirteenth century under Manfred,[4] Aristotle on his death bed, holding in his hand an apple from which the treatise takes its title, is represented as telling his disciples why a philosopher need not fear death and repudiating the doctrines of the mortality of the soul and eternity of the universe. He also tells how the Creator made the spheres and placed lucid stars in each and gave them the virtue of ruling over this inferior world and causing good and evil and life or death. They do not, however, do this of themselves, but men at first thought so and erroneously worshiped the stars until the time of Noah who was the first to recognize the Creator of the spheres.[1]

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[1] II, 9.

[2] *Excursions historiques*, etc., p. 562.

[3] I have read it in an incunabulum edition numbered IA. 49867 in the British Museum.

[4] *Ibid.*, fols. 21v-22r, "Nos Manfredus divi augusti imperatoris frederici filius dei gratia princeps tharentinus honoris montis sancti angeli dominus et illustris regis conradi servi in regno sicilie baiulus . . . quem librum cum non inveniretur inter cristianos, quoniam eum in ebrayco legimus translatum de arabico in hebreum, sanitate rehabita ad eruditionem multorum et de hebrea lingua transtulimus in latinam in quo a compilatore quedam recitabilia in-

Liber de causis proprietatum elementorum et planetarum.

There are also attributed to Aristotle treatises primarily astrological. A "Book on the Properties of the Elements and of the Planets" is cited under his name by Peter of Abano at the end of the thirteenth century in his work on poisons,[2] by Peter d'Ailly in his *Vigintiloquium* [3] written in 1414, and by Pico della Mirandola, who declares it spurious, in his work against astrology written at the close of the fifteenth century. D'Ailly and Pico cite it in regard to the theory of great conjunctions; Abano, for a tale of Socrates and two dragons which we shall repeat later. It is probable that all these citations were from the paraphrase of and commentary on the work by Albertus Magnus [4] who accepted it as a genuine writing of Aristotle. We shall consider its contents in our chapter upon Albertus Magnus.

Other astrological treatises ascribed to Aristotle.

In a manuscript of the Cotton collection in the British Museum is a work of some length upon astrology ascribed to Aristotle.[5] After a discussion of general principles in which the planets, signs, and houses are treated, there are separate books upon the subjects of nativities,[6] and of elections and

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seruntur. Nam dictum librum aristotiles non notavit sed notatus ab aliis extitit qui causam hylaritatis sue mortis discere voluerunt sicut in libri serie continetur."

[1] Edition No. IA. 49867 in the British Museum, fols. 25v-26r.

[2] Cap. 4.

[3] Verbum 4.

[4] *De causis et proprietatibus elementorum,* IX, 585-653 in Borgnet's edition of Albert's works; Albert himself in his treatise on Minerals cites the title as *"Liber de causis proprietatum elementorum et planetarum."*

[5] Cotton Appendix VI, fol. 8r, "liber iste est aristotelis in scientia ipsius astronomie."

[6] Fol. 11v, "Alius liber de nativitatibus"; opens, "Superius prout potuimus promissorum partem explevimus."

interrogations.[1] In a Paris manuscript a treatise on interrogations is ascribed in a marginal heading to "Aristoteles Milesius, a Peripatetic physician." [2] In the Cotton Manuscript in commentaries which then follow, and which are labelled as commentaries "upon the preceding treatise" Ptolemy is mentioned rather than Aristotle.[3] In an astrological manuscript of the fifteenth century at Grenoble written in French, works of Messahala and Zaël translated for Charles V of France are preceded by "a book of judicial astrology according to Aristotle," which opens with "the preface of the last translator," and is in four parts.[4] Perhaps both the above-mentioned manuscripts contain, like a third manuscript at Munich, "The book of judgments which is said by Albert in his *Speculum* to be Aristotle's." [5] This work also occurs in a manuscript at Erfurt.[6] Roger Bacon was much impressed by an astrological treatise ascribed to Aristotle entitled *De impressionibus coelestibus,* and told Pope Clement IV that it was "superior to the entire philosophy of the Latins and can be translated by your order." [7]

Aristotle and two hundred and fifty volumes of the Indians.

A treatise found in two manuscripts of the Bodleian Library bears the titles, *Commentary of Aristotle on Astrology,* and *The book of Aristotle from two hundred and fifty-five volumes of the Indians, containing a digest of all problems, whether pertaining to the sphere or to genethli-*

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[1] Fol. 13r, "De electionibus alius liber"; opens, "Unde constellationibus egyptios imitantes nativitates satis dilucide dixerimus." This book intermingles the subjects of interrogations and elections, and ends at fol. 20v, "Finit liber de interrogationibus."

[2] BN 16208, fol. 76r-, "liber arystotelis milesii medici perypathetici in principiis iudiciorum astronomorum in interrogationibus."

[3] Cotton Appendix VI, fol. 20v, "Incipit commentum super praemissa scilicet praedictum librum"; fol. 23v, "Expositio ad litteram superioris tractatus. Ptolomaeus summus philosophus et excellentissimus egyptiorum rex. . . ."

[4] Grenoble 814, fols. 1-24. "Cy commence le livre de jugemens d'astrologie selon Aristote. Le prologue du derrenier translateur. Aristote fist un livre de jugemens. . . ."

[5] CLM 25010, 15-16th century, fols. 1-12, "liber de iudiciis qui ab Alberto in Speculo suo dicitur esse Aristotelis."

[6] Amplon. Quarto 377, 14th century, fols. 25-36, de iudiciis astrorum. Schum identifies it with the work ascribed to Aristotle by Albert in the *Speculum astronomiae.*

[7] Bridges (1897), I, 389-90; Brewer (1859) p. 473.

alogy.[1] From the text itself and the preface of Hugo Sanctelliensis, the twelfth century translator from Arabic into Latin, addressed to his lord, Michael, bishop of Tarazona, we see that the work is neither entirely by Aristotle nor from the books of the Indians but is a compilation by someone who draws or pretends to draw from some 250 or 255 books[2] of the philosophers, including in addition to treatises by both Aristotle and the Indians, 13 books by Hermes, 13 by Doronius (Dorotheus?), 4 by Ptolemy, one by Democritus, two by Plato, 44 by the Babylonians, 7 by Antiochus, and others by authors whose names are unfamiliar to me and probably misspelled in the manuscripts. In one of the works of Aristotle of which the present work is supposed to make use, there are said to have been described the nativities of twelve thousand men, collected in an effort to establish an experimental basis for astrology.[3] It is not so surprising that the present work bears Aristotle's name, since Hugh had promised his patron Michael, in the prologue to his translation of the *Geometry* of Hanus ben Hanne,[4] that if life endured and opportunity was given he would next set to work as ordered by his patron, not only upon Haly's commentaries on the *Quadripartite* and *Almagest* of Ptolemy, but also upon a certain general commentary by Aristotle on the entire art of astrology.

Works on astrological images.

The *Secret of Secrets* of the Pseudo-Aristotle is immediately followed in one manuscript by chapters or treatises addressed to Alexander and entitled, *Of ideas and forms, Of the impression of forms,* and *Of images and rings.*[5] The theory, very like that of Alkindi, is maintained that "all forms are ruled by supercelestial forms through the spirits of the spheres" and that incantations and images receive their force from the spheres. The seven planets pass on these supercelestial ideas and forms to our inferior world. By selecting proper times for operating one can work good or ill by means of the rays and impressions of the planets. The scientific investigator who properly concentrates and fixes intent, desire, and appetite upon the desired goal can penetrate hidden secrets of secrets and occult science both universal and particular. The writer goes on to emphasize the importance of understanding all the different positions and relationships of the heavenly bodies and also the distribution of terrestrial objects under the planets. He then describes an astrological image which will cause men to reverence and obey you, will repel your enemies in terror, afflict the envious, send visions, and perform other marvelous and stupefying feats too numerous to mention.

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[1] Digby 159, 14th century, fols. 1-87, mutilated at the end. "Liber Aristotilis de ducentis lvque Indorum voluminibus, universalium questionum tam genecialium quam circularium summam continens." At fol. 5v, "Explicit prologus. Incipit Aristotelis commentum in astrologiam." This is the MS which I have chiefly followed. Savile Latin 15 (Bernard 6561), 15th century, fols. 185-204v, is similar.

[2] In the text the number is given as ccl; see Digby 159, fol. 2r.

[3] Digby 159, fol. 2r.

[4] Savile 15, fol. 205r.

[5] Bodleian 67 (Bernard 2136), 14th century, fol. 54r, *De ydeis et formis;* fol. 54v, *De impressione formarum;* fol. 56v, *De ymaginibus et annulis.* These chapters are sometimes included in the *Secret of Secrets,* as in Roger Bacon's version; Steele (1920) 157-63. But

And on necromantic images.

As the *Speculum astronomiae* of Albertus Magnus listed a *Book of Judgments* by Aristotle among deserving works of astronomy and astrology, so in its list of evil books dealing with necromantic images appear a treatise by Hermes addressed to Aristotle and opening, "Aristotle said, 'You have seen me, O Hermes,' " and a treatise ascribed to Aristotle with the sinister title, *Death of the Soul,* opening, "Said Aristotle to King Alexander, 'If you want to perceive.' " This treatise the *Speculum* calls "the worst of all" the evil books on images. Roger Bacon, too, alludes to it by title as filled with figments of the magicians, but does not name Aristotle as author.[1] Peter of Abano in his *Lucidator* follows the *Speculum astronomiae* in listing it among depraved, obscene, and detestable works.[2]

"in the greater part of the Latin MSS this section is entirely omitted"; *Ibid.*, lxii. Steele does not mention Bodleian 67.

[1] Brewer (1859) p. 532, *De secretis,* cap. 3.

[2] BN 2598, fol. 101r, "liber quem Aristoteles attribuit Alexandro et quem nonnulli mortis intitulent anime."

Alexander as an astrologer.

Alexander himself, as well as Aristotle, had some medieval reputation as an astrologer. We have already seen[1] in the tenth and eleventh century manuscripts of the *Mathematica* of Alhandreus, supreme astrologer, that "Alexander of Macedon" was more than once cited as an authority, and that there were also given "Excerpts from the books of Alexander, astrologer, king," and a "Letter of Argafalan to Alexander." Different from this, moreover, was the *Mathematica* of Alexander, supreme astrologer, found in a thirteenth century manuscript, in which from the movements of the planets through the signs one is instructed how to foretell prosperous and adverse journeys, abundance and poverty, misfortune or death of a friend, or to discover stolen articles, sorceries, buried treasure and so forth.[2] A treatise on seven herbs related to the seven planets is sometimes ascribed to Alexander,[3] but perhaps more often to Flaccus Africanus, as we saw in Chapter 46, and at least once to Aristotle.[4]

Aristotle and spirits.

The association of astrological images with spirits of the spheres in one of the above-mentioned works ascribed to Aristotle has already brought us to the border-line of our next topic, Aristotle and spirits. Under this caption may be placed a work found in a fifteenth century manuscript.[1] It also is in part astrological and is associated with the name of Hermes as well as of Aristotle. Its title runs, *The book of the spiritual works of Aristotle, or the book Antimaquis, which is the book of the secrets of Hermes: wonderful things can be accomplished by means of this book and 'tis the ancient book of the seven planets.* The treatise opens, "To every people and clime pertains a group of spirits." It then maps out these regions of different spirits in accordance with the planets and signs of the zodiac. Apparently this is the same work as that which Hunain ibn Ishak translated into Arabic and of which he says, "Among the works of Aristotle which we have found and translated from Greek into Arabic was *The book of the Causes of Spirituals* which has Hermes for author. . . . It is the book in which Aristotle treats of the causes of spirituals, talismans, the art of their operation, and how to hinder it, ordered after the seven climates." [2] It was probably some such spurious work that William of Auvergne had in mind when he spoke of Aristotle's boast that a spirit had descended unto him from the sphere of Venus.[3]

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[1] See above, I, 713-714.

[2] Ashmole 369, late 13th century, fols. 77-84v, "Mathematica Alexandri summi astrologi. In exordio omnis creature herus huranicus inter cuncta sidera xii maluit signa fore / nam quod lineam designat eandem stellam occupat. Explicit." Cap. x, de inveniendo de prospero aut adverso itinere; xi, de copia et paupertate; xiv, de nece aut casu amici; xvi, de latrocinio inveniendo; xxiv, de pecunia in terra defossa; xxxviii, de noscendis maleficiis.

[3] In the preface to the Kirandes; in Montpellier 277, 15th century; and in Ashmole 1448, 15th century, pp. 44-45, "Virtutes 7 herbarum a septem planetis secundum Alexandrum Imperatorem." It is also embodied in some editions and MSS of the *Liber aggregationis* or *Experimenta* attributed to Albertus Magnus (see Chapter 63), where it is entitled, "Virtutes herbarum septem secundum Alexandrum Imperatorem."

[4] Ashmole 1741, late 14th century, fol. 143, "Incipiunt virtutes septem herbarum Aristotilis. Et has quidem virtutes habent ipse septem herbe ab influentia 7 planetarum. Nam contingit unamquamque recipere virtutem suam a superioribus naturaliter. Nam dicit Aristotiles quod corpora inferiora reguntur per superiora."

On plants and the *Lapidary.*

No genuine work of Aristotle on vegetables or minerals has come down to us to accompany his celebrated *History of Animals,* but supposititious writings were soon found by the Arabs to fill this gap. On plants a brief treatise by Nicolaus Damascenus passed for Aristotle's. Alfred of Sarchel translated it from Arabic into Latin,[4] presumably before the close of the twelfth century, since he dedicated it to Roger of Hereford, and Albertus Magnus expanded its two short books into seven long ones in his *De vegetabilibus et plantis.* There also existed in Arabic a *Lapidary* ascribed to Aristotle,[5] which we have heard cited in the ninth century by Costa ben Luca. Ruska believes the work to be of Syrian and Persian origin,[1] although one Latin text professes to have been originally translated from Greek into Syriac.[2] Valentin Rose regarded it as the basis of all subsequent Arabic mineralogy, but found only two Latin manuscripts of it.[3] Albertus Magnus in his *Minerals* confesses that, although he had sought diligently in divers regions of the world, he had seen only excerpts from Aristotle's work. But another writer of the thirteenth century, Arnold of Saxony, cites translations of Aristotle on stones both by Dioscorides, which would seem sheer nonsense, and by Gerard, presumably of Cremona. Gerard's translation occurs in one of Rose's manuscripts; the other seems to give a version translated from the Hebrew.

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[1] Sloane 3854, 15th century, fols. 105v-110.

[2] L. Blochet, *Études sur le Gnosticisme musulman,* in *Rivista degli studi orientali,* IV, 76.

[3] *De universo,* II, ii, 39 and 98; II, iii, 6. I presume that there is some connection between our present treatise and those on the seven planets, Venus, and the moon mentioned in our chapter on the Hermetic books.

[4] One MS is Harleian 3487, 14th century, #11.

[5] V. Rose, *Aristoteles de lapidibus und Arnoldus Saxo,* in *Zeitschrift für deutsches Alterthum,* XVIII (1875) 321 *et seq.* More

Virtues of gems.

In Gerard's translation, a work marked by puerile Latin style, the *Lapidary* of Aristotle is about equally devoted to marvelous properties of stones and tales of Alexander the Great. After some general discussion of stones and their wonderful properties, particular gems are taken up. The *gesha* brings misfortune. Its wearer sleeps poorly, has many worries, many altercations and law-suits. If it is hung about a boy's neck, it makes him drivel. "There is great occult force" in the magnet, and instructions are given how to set water on fire with it. Several stones possess the property of neutralizing spells and counteracting the work of demons. With another stone the Indians make many

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recently the *Lapidary* of Aristotle has been edited by J. Ruska, *Das Steinbuch des Aristoteles . . . nach der arabischen Handschrift,* Heidelberg, 1912, who gives both the Latin of the Liège MS and the text of the translation into Arabic by Luca ben Serapion from BN 2772, with a German translation of it.

[1] Ruska (1912), p. 43.

[2] *Ibid.,* p. 183, "Et ego transfero ipsum ex greco sermone in ydyoma su(r)orum vel Syrorum."

[3] Liège 77, 14th century; printed by Rose (1875) pp. 349-82.

Montpellier 277, 15th century, fol. 127-; printed by Rose (1875) pp. 384-97.

The following treatises, also ascribed to Aristotle, I have not examined: Sloane 2459, 15th century, fols. 9v-16, *de proprietatibus herbarum et lapidum;* Vienna 2301, 15th century, fols. 81-2, "Isti sunt lapides quorum virtutes misit Aristotiles in scriptis maximo imperatori Alexandro." Perhaps the last may have reference to philosopher's stones, like the similar treatise of Aristotle to Alexander noted above in our discussion of the pseudo-Aristotelian alchemical treatises.

incantations. Vultures were the first to discover the virtue of the stone *filcrum coarton* in hastening delivery. When a female vulture was near death from the eggs hardening in her body, the male flew off to India and brought back this stone which afforded instant relief. Another stone is so soporific that suspended about the neck it induces a sleep lasting three days and nights, and the effects of which are thrown off with difficulty even on the fourth day, when the sleeper will awake but will act as if he were intoxicated and will still seem sleepier than anyone else. Another stone prevents a horse from whinnying, if suspended from his neck.

Stories of Alexander and of Socrates.

Other gems suggest stories of Alexander. Near the frontier of India in a valley guarded by deadly serpents whose mere glance was fatal were many precious gems. Alexander disposed of the serpents by erecting mirrors in which they might stare themselves to death, and he then secured the gems by employing the carcasses of sheep in the manner which we have already heard described by Epiphanius.[1] A somewhat similar tale is told of Socrates by Albertus Magnus in his commentary on the pseudo-Aristotelian work on the properties of the elements and planets.[2] In the reign of Philip of Macedon, who is himself described as a philosopher and astronomer, the road between two mountains in Armenia became so poisoned that no one could pass. Philip vainly inquired the cause from his sages until Socrates came to the rescue and, by erecting a tower as high as the mountains with a steel mirror on top of it, saw two dragons polluting the air. The mere glance of these dragons was apparently not deadly, for men in air-tight armor went in and killed them. The same story is told by William of St. Cloud, who composed astronomical tables based upon his own observations from about 1285 to 1321, in which he detected errors in the earlier tables of Thebit, Toulouse, and Toledo.[3] In Peter of Abano's treatise on poisons,[1] however, although he too cites the Pseudo-Aristotle *On the causes of the elements,* the mirror has become a glass cave in which Socrates ensconces himself to observe the serpents. A *Lapidary* dedicated to King Wenzel II of Bohemia tells of Socrates' killing a dragon by use of quicksilver.[2] That Socrates also shared the medieval reputation of Aristotle and Plato for astrology and divination we have already seen from the *Prenostica Socratis Basilei.*

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[1] See above chapter 21, I, 496.

[2] *De causis elementorum, etc.,* II, ii, 1 (Borgnet, IX 643).

[3] HL XXV, 65.

Alexander's submarine

Similar to Abano's tale of Socrates in the glass cave is the story told a century earlier by Alexander Neckam of Alexander himself. So sedulous an investigator of nature was the Macedonian, says Neckam, that he went down in a glass vessel to observe the natures and customs of the fishes. He would seem to have remained submerged for some time, since Neckam informs us that he took a cock with him in order to tell when it was dawn by the bird's crowing. This primitive submarine had at least a suggestion of war about it, since Neckam goes on to say that Alexander learned how to lay ambushes against the foe by observing one army of fishes attack another. Unfortunately, however, Alexander failed to commit to writing his observations, whether military or scientific, of deep-sea life; and Neckam grieves that very few data on the natures of fishes have come to his attention.[3] We shall hear Roger Bacon tell of Alexander's descending to see the secrets of the deep on the authority of Ethicus.[4]

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[1] *De venenis,* cap. 5, probably written in 1316, but see chapter 70, appendix vi.

[2] Aristotle, *Lapidarius et Liber de physionomia,* Merseburg, 1473, p. 8.

[3] *De naturis rerum,* II, 21. In an illustrated 13th century MS of the vernacular Romance of Alexander three pictures are devoted to his submarine. CU Trinity 1446, 1250 A. D., fol. 27r, "*Coment Alisandre vesqui suz les ewes;* a covered ship with windows under green water, Alexander and three men in it; fol. 27v, *Des nefs ke sont apelees colifas;* a similar ship in the water, no one visible in it; *Coment Alisandre encercha la nature de pessons;* Alexander and two men in the ship, fish and mermaid below." I have quoted James' description of the MS (III, 488).

See also Lacroix, *Science and Literature in the Middle Ages,* 1878, Fig. 87, p. 119, for Alexander descending to the bottom of the sea in a glass cask, from a thirteenth century MS, Brussels 11040.

[4] See chapter 61, pp. 654-5.

Arabian tales of Alexander.

Neckam's account differs a good deal from the story as told by the Arabian historian, Mas'udi, in the tenth century. There we read that, when Alexander was building the city of Alexandria, monsters came from the sea every night and overthrew the walls that had been built during the day. Night watchmen proved of no avail, so Alexander had a box made ten cubits long and five wide, with glass sides fastened into the frame work by means of pitch and resin. He then entered the box with two draughtsmen, who, after it had been let down to the bottom of the sea, made exact drawings of the monsters, who had human bodies but the heads of beasts. From these sketches Alexander had images constructed and placed on pillars, and these magic figures served to keep off the monsters until the city was completed. But the effect apparently began to wear off and talismans had to be added on the pillars to prevent the monsters from coming and devouring the inhabitants, as they had begun to do again.[1] Another Arab, Abu-Shâker, of the thirteenth century, repeats a current tradition that Aristotle gave Alexander a box of wax soldiers which were nailed, with inverted spears and swords and severed bow-strings, face-downwards in the box, which in its turn was fastened by a chain. As long as the box remained in Alexander's possession and he repeated the formulae which Aristotle taught him whenever he took the box up or put it down, he would triumph over his foes in war.[2] This reminds one of the methods of warfare employed by Alexander's fabled natural father, Nectanebus.

A magic horn.

While we are speaking of military matters, it may be noted that in a manuscript of the thirteenth century which once belonged to an Albertus Bohemus or Beham, dean of the church at Padua, and seems to have been his note-book, we find between the *Secret of Secrets* of the Pseudo-Aristotle and a treatise on the significations of the moon in the signs "a delineation of a brazen horn made with marvelous art by which Alexander in time of war summoned his army from a distance of sixty miles." [1] Such a horn "of Temistius" is mentioned in some versions of the *Secret of Secrets*.[2]

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[1] Budge, *Egyptian Magic,* 1899, pp. 152-6; Mas'udi, *Les Prairies d'Or*, ed. B. de Maynard and Pavet de Courteille, 1861, II, 425ff.

[2] Budge (1899), pp. 95-6.

More stories of Alexander and gems.

But to return to other tales of Alexander in the *Lapidary*. Once he saw afar enchanters and enchantresses who slew and wounded the men of his army by their diabolical power until Alexander prayed to God, who revealed two stones which counteracted the sorcery. On another occasion when by Alexander's order his barons had carried off certain gems, during the night following they suffered much insult from demons and were sore afraid, since sticks and stones were thrown about the camp by unseen hands and men were beaten without knowing whence the blows came. It thus became apparent that the demons cherished those gems as their especial property and were accustomed to perform occult operations with them of which they did not wish men to learn the secret. Alexander found that these gems would protect him from any beast, serpent, or demon, although the nocturnal experience of his barons would scarcely seem to support this last point. On a third occasion his troops were held motionless and gazed open-mouthed at certain stones, until a bird fluttered down and covered the gems with its outstretched wings. Then Alexander had his followers close their eyes and carry the stones away under cover and place them on top of the wall of one of his cities so that no one might scale the wall to spy upon the town.

Story of Alexander's belt.

Yet another curious story of Alexander and a stone is repeated by Peter of Abano in his work on poisons [3] from a treatise "On the Nature of Serpents" which he ascribes to Aristotle. Alexander always wore a certain stone in his belt to give him good luck in his battles, but on his return from India, while bathing in the Euphrates, he removed the belt, whereupon a serpent suddenly appeared, bit the stone out of the belt, and vomited it into the river. Deprived of his talisman, Alexander presently met his death.[1]

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[1] CLM 2574b, bombyc. 13th century, fol. 69v. Although Steele (1920) p. lviii, says, "No Latin manuscript is known in which there is a figure of the horn, with the exception of that in Holkam Hall, in the borders of which an entirely fanciful instrument is depicted (reproduced in plate 151 of the Roxburghe Club publication of 1914). There are drawings in MSS C and D of the Eastern Arabic text, of entirely different shape."

[2] Steele (1920), p. 151.

[3] Cap. 5.

The royal *Lapidary* of Wenzel II of Bohemia.

Another *Lapidary,* printed as Aristotle's at Merseburg in 1473, is really a compilation of previous medieval works on the subject with the addition of some items derived from the personal knowledge or experience of the author. It was composed "to the honor of almighty God and the glory and perpetual memory of that virtuous and most glorious prince, Wenzel II, King of Bohemia" (1278-1305). As the treatise itself states, "the Lapidary of Aristotle in the recent translation from the Greek" is only one of its sources along with Avicenna, Constantinus Africanus, Albertus Magnus, and others.

Chiromancy and *Physiognomy of Aristotle.*

Another work which claims Aristotelian authorship only in its title is the *Chiromancy of Aristotle,* printed at Ulm in 1490, which quotes freely from Albertus Magnus and Avicenna. There are also brief tracts on chiromancy ascribed to Aristotle in manuscripts of the thirteenth or fourteenth century.[2] Förster has identified Polemon as the author of the Greek treatise on physiognomy ascribed to Aristotle.[3] The art of physiognomy of course professed to read character from the face or other parts of the body, and chiromancy which we have just mentioned is really a branch of it. In Latin translation the treatise was accepted as Aristotle's by such medieval schoolmen as Albertus Magnus and Duns Scotus. There are many manuscripts of it in the British Museum, including one which perhaps dates back to the twelfth century.[1] Its popularity continued long after the invention of printing, as is shown by separate editions of it brought out at Paris in 1535 and at Wittenberg in 1538, and by commentaries upon it [2] published at Paris in 1611, at Bologna in 1621, and at Toulouse in 1636. Besides such separate manuscripts and editions of it, it was also regularly embodied in the numerous copies of the pseudo-Aristotelian work to which we next turn.

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[1] Very similar is the story in the Gilgamesh epic, a work "far more ancient than Genesis," of a serpent stealing a life-giving plant from Gilgamesh while he was bathing in a well or brook. The plant, which had been revealed to Gilgamesh by the deified Utnapishtim, "had the miraculous power of renewing youth and bore the name, 'the old man becomes young.'" Sir James Frazer (1918), I, 50-51, follows Rabbi Julian Morgenstern ("On Gilgamesh Epic, XI, 274-320," in *Zeitschrift f. Assyriologie,* XXIX, 1915, p. 284ff) in connecting this incident with the serpent and the tree of life in the Biblical account of the fall of man, and gives further examples from primitive folk-lore of other jealous animals, such as the dog, frog, duck, and lizard, perverting divine gifts or good tidings to man to their own profit.

[2] Sloane 2030, fols. 125-26; Additional 15236, fols. 154-60: BN, 7420A (14th century) ♯16.

[3] Richard Förster, *De Aristotelis quae feruntur physiognomonicis recensendis, Kiliae,* 1882; *De translat. latin. physiognom., Kiliae,* 1884; *Scriptores Physiognomici, Lipsiae,* 1893-1894.

The Secret of Secrets.

Most widely influential upon the medieval mind of all the spurious works attributed to Aristotle was *The Secret of Secrets.* Förster enumerated two hundred and seven Latin manuscripts of it and his list is probably far from complete.[3] Gaster calls it "The most popular book of the middle ages." [4] This is not surprising since it purports to sum up in concise form what the greatest of ancient philosophers deemed it essential for the greatest of ancient rulers to know, and since under the alluring pretense of revealing great secrets in parable and riddle it really masses together a number of the best-tested and most often repeated maxims of personal hygiene and practical philosophy, and some of the superstitions to which men have shown themselves most inclined. Every European library of consequence contains a number of copies of it. It was translated into almost every European language and was often versified, as in Lydgate's and Burgh's *Secrees of old Philisoffres.*[1] Albertus Magnus cited it as Aristotle's;[2] Roger Bacon wrote a rather jejune commentary upon it.[3] It was printed a number of times before 1500.[4]

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[1] Cotton Julius D-viii, fol. 126ff.; Harleian 3969; Egerton 847; Sloane 2030, fol. 95-103; Additional 15236, fol. 160 (in abbreviated form); Sloane 3281, fols. 19-23; Sloane 3584; Egerton 2852, fol. 115v, *et seq.*

[2] There is a manuscript copy of a commentary on it of the fourteenth century at Erfurt, Amplon. Quarto 186. See Schum's catalogue for MSS of the *Physiognomia* itself in the Amplonian collection.

[3] R. Förster, *De Aristotelis quae feruntur secreta secretorum Commentatio,* Kiliae, 1888; *Handschriften und Ausgaben des pseudo-aristotelischen Secretum secretorum,* in *Centralblatt f. Bibliothekwesen,* VI (1889), 1-22, 57-76. And see Steele (1920).

[4] M. Gaster, in his "Introduction to a Hebrew version of the Secret of Secrets," in the *Journal of the Royal Asiatic Society* (1908, part 2), pp. 1065-84; for the Hebrew text and an English translation, *Ibid.* (1907), pp. 879-913 and (1908, part 1), pp. 111-62.

Its textual history.

The Secrets of Secrets is believed to be the outcome of a gradual process of compilation from very varied sources, and to have reached something like its present form by the seventh or eighth century of our era. But its chapters on physiognomy, as we have seen, go back to Polemon's treatise, and part of its medical discussion is said to be borrowed from Diocles Caristes who wrote about 320 B. C. Some Graeco-Persian treatise is thought to be the basis of its discussion of kingship. It is also believed to have appropriated bits from popular literature to its own uses. In Arabic there is extant both a longer and a shorter version, and Gaster has edited a Hebrew text which is apparently derived from an Arabic original different from that of any Latin text. The process of successive compilation, or at least, re-editing and repeated translation which the work underwent is suggested by a series of prologues which occur at the beginning. Following the preface of the Latin translator and the table of contents comes what is called "the prologue of a certain doctor in commendation of Aristotle,"[1] in which omnipotent God is prayed to guard the king and some anonymous editor states that he has executed the mandate enjoined upon him to procure the moral work on royal conduct called *The Secret of Secrets,* which Aristotle, chief of philosophers, composed. After some talk about Aristotle and Alexander a second prologue begins with the sentence, "John who translated this book, son of a patrician, most skilful and faithful interpreter of languages, says." This John appears to have been Yuhanna ibn el-Batrik, or Ibn Yahya al-Batrik, who died in 815 A. D.[2] What he says is that he searched the world over until he came to an oracle of the sun which Esculapides had constructed. There he found a solitary abstemious sage who presented him with this book which he translated from Greek into Chaldaic and thence into Arabic. This passage reminds one of Harpocration's prefatory remarks to his daughter in the *Kiranides;* indeed, it is quite in the usual style of apocryphal writings.

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[1] Ed. Robert Steele, EETS, LXVI, London, 1894. Volume LXXIV contains three earlier English versions. There are numerous MSS of it in Italian in the Riccardian and Palatini collections at Florence.

[2] *De Somno et vigilia,* I, ii, 7.

[3] Tanner 116, 13th century; Corpus Christi 149, 15th century. Recently edited by Robert Steele, 1920, as Fasc. V of his *Opera hactenus inedita Rogeri Baconi.*

[4] There are considerable discrepancies between the different early printed editions, which differ in length, order of arrangement, tables of contents, and number of chapters. And in the same edition the chapter headings given in the course of the text may not agree with those in the table of contents, which as a rule, even in the MSS, does not fully cover the subject-matter of the text. The different printers have probably used different manuscripts for their editions rather than made any new additions of their own. The following editions are those to which references will be made in the following pages.

An edition printed at Cologne about 1480, which I examined at the Harvard University Library, divides the text into only thirty chapters and seems imperfect.

An edition of about 1485, which I examined at the British Museum, where it was numbered IA.10756, has 74 chapters, and the headings of its 25th and 30th chapters, for instance, agree with those of the 11th and 13th chapters in the Harvard copy.

A third edition of Paris, 1520, has no numbered chapters and contains passages not found in the two earlier editions.

As a check upon these printed texts I have examined the three following MSS, two of the 13th, and one of the 14th, century. Of these Egerton 2676 corresponds fairly closely throughout to the edition numbered IA.10756 in the British Museum.

Egerton 2676, 13th century, fols. 3-52.

BN 6584, 13th century, fols. 1r-32v.

Bodleian 67, 14th century, fols. 1-53v, is much like the preceding MS.

The Latin translations of John of Spain and Philip.

In the matter of the Latin translation we are on somewhat more certain ground. John of Spain in the first half of the twelfth century seems to have translated only the medical portion.[3] Manuscripts of this partial translation are relatively few,[1] and it was presently superseded by the complete translation made either in the twelfth or early thirteenth century [2] by Philip, "the least of his clerics" for "his most excellent lord, most strenuous in the cult of the Christian religion, Guido of Valencia, glorious pontiff of the city of Tripoli." Philip goes on to say in his dedicatory preface that it was when he was with Guido in Antioch that they found "this pearl of philosophy, . . . this book which contains something useful about almost every science," and which it pleased Guido to have translated from Arabic into Latin. Although the various printed editions and manuscripts of *The Secret of Secrets* in Latin vary considerably, they regularly are preceded by this ascription of the Latin translation to Philip, and usually by the other prologues afore-mentioned. Who this Philip was, other than a cleric of Tripoli, is still undetermined. If he was the same as the papal physician whom Alexander III in 1177 proposed to send on a mission to Prester John,[3] he had probably made his translation before that date. J. Wood Brown would identify him with Philip of Salerno, a royal notary whose name appears in 1200 on deeds in the kingdom of Sicily.[4]

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[1] BN 6584, fol. 1v, "De prologo cuiusdam doctoris in commendatione aristotelis." See also Digby 228, 14th century, fol. 27, where a scribe has written in the upper margin, "In isto libello primo ponitur prologus, deinde tabula contentorum in libro, deinde prologus cuiusdam doctoris in commendacionem Aristotilis, deinde prologus Iohannis qui transtulit librum istum. . . ." In Egerton 2676, fol. 6r, "Deus omnipotens custodiat regem. . . ."

[2] Steele (1920), p. xi.

[3] Steinschneider (1905), p. 42, it is true, says, "Ob Joh. selbst das ganze Secretum übersetzt habe, ist noch nicht ermittelt"; but the following passage, cited by Giacosa (1901), p. 386, from Bibl. Angelica Rome, Cod. 1481, 12th century, fols. 144-146v, indicates that he translated only the medical part. "Cum de utilitate corporis olim tractarim et a me quasi essem

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medicus vestra nobilitas quereret ut brevem libellum et de observatione diete et de continentia cordis in qualibus se debent contineri qui sanitatem corporis cupiunt servare accidit ut dum cogitarem vestre iussioni obedire huius rei exempliar aristotelis philosophi Alexandro dictum repente in mente occurreret quod excerpi de libro qui arabice vocatur ciralacerar id est secretum secretorum que fecit fieri predictus Aristotelis philosophus Alexandro regi magno de dispositione regni in quo continentur multa regibus utilia. . . ."

Steele (1920) pp. xvii-xviii, gives the same passage, worded and spelled a little differently, from another MS, Addit. 26770.

[1] Ed. H. Souchier, *Denkmäler provenzal. Lit. u. Sprache,* Halle, 1883, I, 473 *et seq.*

[2] Thirteenth century MSS of Philip's translation are numerous: I have not noted a 12th century one.

[3] See above, chapter 47, p. 244.

[4] Brown (1897), pp. 19-20, 36-7. But not much reliance can be placed on the inclusion of this name, "Master Philip of Tripoli," in a title which Brown (p. 20) quotes from a De Rossi MS, "The Book of the Inspections of Urine according to the opinion of the Masters, Peter of Berenico, Constantine Damascenus, and Julius of Salerno; which was composed by command of the Emperor Frederick, Anno Domini 1212, in the month of February, and was revised by Master Philip of Tripoli and Master Gerard of Cremona at the orders of the King of Spain," etc., since Gerard of Cremona at least had died in 1187 and there was no "king of Spain" until 1479.

I have already suggested that possibly he translated the *Kiranides.*

Philip's preface.

Returning to Philip's preface to Guido, it may be noted that he states that Latins do not have the work, and that it is rare among the Arabs.[1] His translation is a free one since the Arabic idiom is different from the Latin. Aristotle wrote this book in response to the petition of King Alexander his disciple who demanded that Aristotle should either come to him or faithfully reveal the secrets of certain arts, namely, the motion, operation, and power of the stars in astronomy, the art of alchemy, the art of knowing natures and working enchantments, and the art of geomancy. Aristotle was too old to come in person, and although it had been his intention to conceal in every way the secrets of the said sciences, yet he did not venture to contradict the will and command of so great a lord. He hid some matters, however, under enigmas and figurative locutions. For Alexander's convenience he divided the work into ten books, each of which is divided into chapters and headings. Philip adds that for his readers' convenience he has collected these headings at the beginning of the work, and a table of contents follows.[2] Then come the two older prologues

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Brown does not give the Latin for the passage, but if the date 1212 could be regarded as Spanish era and turned into 1174 A. D., Gerard of Cremona would still be living, the emperor would be Frederick Barbarossa instead of Frederick II, and Master Philip of Tripoli might be the same Philip whom Pope Alexander III proposed to send to Prester John in 1177.

Steele (1920) p. xix, inclines to identify Philip of Tripoli with a canon of Byblos from 1243 to 1248, but that seems to me too late a date for his translation of *The Secret of Secrets.*

[1] BN 6584, fol. 1r, "Hunc librum quo carebant latini eo quod apud paucissimos arabies reperitur transtuli cum magno labore . . ." A considerable portion of Philip's preface is omitted in the Harvard edition.

[2] The preliminary table of contents, however, gives only chapter headings, which in BN 6584 are 82 in number, but the beginnings of the ten books are indicated in the text in BN 6584 as follows. The numbers in parentheses are the corresponding leaves in Bodleian 67 which, however, omits mention of the book and its number except in the case of the fourth book.

Fol. 3v (5r), Incipit liber primus. Epistola ad Alexandrum.

Fol. 6r, Secundus liber de dispositione Regali et reverentia Regis.

Fol. 12r (18v), Incipit liber tertius. Cum hoc corpus corruptibile sit eique accidit corruptio. . . .

Fol. 22r (36r), Incipit liber

which we have already described, next a letter of Aristotle to Alexander on the extrinsic and intrinsic causes of his work,[1] and then with a chapter which is usually headed *Distinctio regum* or *Reges sunt quatuor* begins the discussion of kingship which is the backbone of the work.

Prominence of occult science.

It is evident from Philip's preface that occult science also forms a leading feature in the work as known to him. Gaster, who contended that the Hebrew translation from the Arabic which he edited was as old as either John of Spain's or Philip's Latin translations, although the oldest of the four manuscripts which he collated for his text is dated only in 1382 A. D., made a rather misleading statement when he affirmed, "Of the astrology looming so largely in the later European recensions the Hebrew has only a faint trace." [2] As a matter of fact some of the printed editions contain less astrology than the thirteenth century manuscripts, while Gaster's Hebrew version has much more than "a faint trace" of astrology. But more of this later.

Absence of mysticism.

On the other hand, I cannot fully subscribe to Steinschneider's characterization of *The Secret of Secrets* as "a wretched compilation of philosophical mysticism and varied superstition." [3] Of superstition there is a great deal, but of philosophical mysticism there is practically none. Despite the title and the promise in Philip's preface of enigmatic and figurative language, the tone of the text is seldom mystical, and its philosophy is of a very practical sort.

Discussion of kingship.

Nor can *The Secret of Secrets* be dismissed as merely "a wretched compilation." Those portions which deal with

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quartus. transtulit magister philippus tripolitanus de forma iusticie.

Fol. 28r (44v), Liber Quintus de scribis et scriptoribus secretorum.

Fol. 28r (45r), Liber Sextus de nuntiis et informationibus ipsorum.

Fol. 28v (46v), Liber Septimus de hiis qui sr' intendunt et habent curam subditorum.

Fol. 29r (47r), Liber Octavus de dispositione ductoris sui et de electione bellatorum et procerum inferiores (?).

Fol. 29v (48r), Liber Nonus de regimine bellatorum et forma aggrediendi bellum et pronatationibus eorundem.

Fol. 30v (50v), Sermo de phisionomia cuiuslibet hominis.

[1] It is omitted in some printed editions, but occurs in both 13th century MSS which I examined.

[2] Gaster (1908), p. 1076.

[3] Steinschneider (1905), p. 60.

kingcraft and government display shrewdness and common sense, worldly wisdom and knowledge of human nature, are not restricted by being written from any one premise or view-point, and often evince real enlightenment. Those historians who have declared the love of fame a new product of the Italian Renaissance should have read the chapter on fame in this most popular book of the middle ages, where we find such statements as that royal power ought not to be desired for its own sake but for the sole purpose of achieving fame. Other noteworthy utterances indicative of the tone and thought of the book are that "the intellect . . . is the root of all things praiseworthy"; that kings should cultivate the sciences; that liberality involves respect for others' property; that "war destroys order and devastates the lands and turns everything to chaos"; that no earthly ruler should shed blood, which is reserved for God alone, but limit his punishments to imprisonment, flogging, and torture; that the king, as Chief Justice Coke later told James I, is under the law; that taxes upon merchants should be light so that they will remain in the country and contribute to its prosperity; that his people are a king's true treasury and that he should acquaint himself with their needs and watch over their interests.

Medical discussion.

From the medical passages of the book one would infer that the art of healing at first developed more slowly than the art of ruling in the world's history. The medical theory of *The Secret of Secrets* is not of an advanced or complex sort, but is a combination of curious notions, such as that vomiting once a month or oftener is beneficial, and sensible ideas, such as that life consists of natural heat and that it is very important to keep the abdomen warm and the bowels moving regularly. Turkish baths are described for perhaps the first time in Europe, and Alexander is advised to keep his teeth and mouth clean. The well-known apothegm of Hippocrates is quoted, "I would rather eat to live than live to eat," and Alexander is advised to cease eating while he still has an appetite.

Astrology.

Much of the advice offered to Alexander by Aristotle in *The Secret of Secrets* is astrological. Among those studies which the king should promote, the only one specifically mentioned is astrology, which considers "the course of the year and of the stars, the coming festivals and solemnities of the month, the course of the planets, the cause of the shortening and lengthening of days and nights, the signs of the stars which determine the future and many other things which pertain to prediction of the future." [1] Alexander is adjured "not to rise up or sit down or eat or drink or do anything without consulting a man skilled in the art of astronomy." [2] Later the two parts of astronomy are distinguished, that is, astronomy and astrology in our sense of the words. Alexander is further warned to put no faith in the utterances of those stupid persons who declare that the science of the stars is too difficult to master. No less stupid is the argument of others who affirm that God has foreseen and foreordained everything from eternity and that consequently all things happen of necessity and it is therefore of no advantage to predict events which cannot be avoided. For even if things happened of necessity, it would be easier to bear them by foreknowing and preparing for them beforehand, just as men make preparations against the coming of a cold winter—the familiar contention of Ptolemy. But *The Secret of Secrets* also believes that one should pray God in His mercy to avert future evils and ordain otherwise, "For He has not so ordained things that to ordain otherwise derogates in any respect from His Providence." But this is not so approved astrological doctrine. Later in the work Alexander is once more urged never to take medicine or open a vein except with the approval of his astronomers,[3] and directions are given as to the constellations under which bleeding should be performed and also concerning the taking of laxatives with reference to the position of the moon in the signs of the zodiac.[1] Later the work discusses the relations of the four elements and of various herbs to the seven planets,[2] and in the next to last chapter Alexander is advised to conduct his wars under the guidance of astrology.[3]

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[1] Cap. 11 (Harvard copy); cap. 25 (BM IA.10756); Egerton 2676, fol. 12r; BN 6584, fol. 9v; Steele (1920) pp. 58-59.

[2] Cap. 13 (Harvard copy); cap. 30 (BM IA.10756); Egerton 2676, fol. 13r; BN 6584, fol. 10r; Steele (1920) p. 60; also in Gaster's Hebrew text.

[3] Egerton 2676, fol. 32r; cap. 62 (BM IA.10756); fol. 33r (Paris, 1520); BN 6584, fol. 19v; Steele (1920) pp. 108-10.

Story of the two boys.

There is much indulging in astrological theory in the midst of the chapter on Justice, and the constitution of the universe is set forth from the first and highest simple spiritual substance down through the nine heavens and spheres to the lowest inferiors. To illustrate the power of the stars the story is presently told of two boys,[4] one a weaver's son, the other a royal prince of India. Sages who were chance guests in the weaver's house at the time of the child's birth noted that his horoscope was that of a courtier high in royal councils but kept their discovery to themselves. The boy's parents vainly tried to make a weaver of him, but even beatings were in vain; he was finally allowed to follow his natural inclination, secured an education, and became in time a royal governor. The king's son, on the contrary, despite his royal birth and the fact that his father sent him through all his provinces to learn the sciences, would take no interest in anything except mechanics conformably to his horoscope.

Virtues of stones and herbs, incantations and amulets.

In *The Secret of Secrets* the Pseudo-Aristotle refers Alexander for the virtues of gems and herbs to his treatises on stones and plants, presumably those which we have already described. He does not entirely refrain from discussion of such marvelous properties in the present work, however, mentioning the use of the virtues of stones in connection with incantations. We also again hear of stones which will prevent any army from withstanding Alexander or which will cause horses to whinny or keep them from doing so; and of herbs which bring true or false dreams or cause joy, love, hate, honor, reverence, courage, and inertia.[1] One recipe reads, "If you take in the name of someone seven grains of the seeds of the herb called androsimon, and hold them in his name when Lucifer and Venus are rising so that their rays touch him (or them?), and if you give him those seven grains to eat or pulverized in drink, fear of you will ever abide in his heart and he will obey you for the rest of his life." [2] The discussion of incantations, astrological images, and amulets is omitted from many Latin manuscripts but occurs in Roger Bacon's version.[3]

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[1] The Paris, 1520, edition then goes on to explain the effects of incantations and images upon astrological grounds, but this passage seems to be missing from the earlier printed editions and the thirteenth century manuscripts. Roger Bacon, however, implies that incantations were present in Philip's original translation, and one Arabic MS gives cabalistic signs for the planets; Steele (1920) pp. 258-9.

[2] This passage is found both in Egerton MS 2676 and in BM IA.10756. BN 6584, fol. 21r-v. Bodl. 67, fol. 32v-35v. Steele, 119-20.

[3] Cap. 73 (BM IA.10756); fols. 44v-45r (Paris, 1520); BN 6584, fol. 30v; Steele, 155-6.

[4] BN 6584, fol. 21r; also in Gaster's Hebrew version; cap. 26 in the Harvard copy; Steele, 137.

Thirteenth century scepticism.

The extreme powers attributed to herbs and stones in *The Secret of Secrets* aroused some scepticism among its Latin readers of the thirteenth century.[4] Geoffrey of Waterford, a Dominican from Ireland who died about 1300, translated *The Secret of Secrets* into French. He criticized, however, its assertions concerning the virtues of stones and herbs as more akin to fables than to philosophy, a fact of which, he adds, all clerks who know Latin well are aware. He wonders why Alexander had to win his battles by hard fighting when Aristotle is supposed to inform him in this book of a stone which will always rout the enemy. Geoffrey decides that such false statements are the work of the translators and that Aristotle is the author only of what is well said or reasonable in the work.

Number and alchemy.

Something is said in *The Secret of Secrets* of the occult properties and relative perfection of numbers, and as usual the preference is for the numbers, three, four, seven, and ten.[1] The Hebrew version adds a puerile method of divining who will be victor in a battle by a numerical calculation based upon the letters in the names of the generals. The Latin versions of the thirteenth century contain a chapter on alchemy which had great influence and gives a recipe for the philosopher's stone and the Emerald Table of Hermes.[2] But in the Hebrew version and Achillini's printed text occurs a passage in which Alexander is warned that alchemy is not a true science.[3]

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[1] Gaster, pp. 116, 160-62; Egerton 2676, fols. 34r-35r; cap. 66 (BM IA.10756); fol. 37v (Paris, 1520); BN 6584, fol. 20r-22r; Steele, 121-2.

[2] Egerton 2676, fol. 36v; BN 6584, fol. 22r; Steele, 122.

[3] Steele (1920) pp. lxii, 157-63, 252-61; Paris (1520), fol. 37; Gaster, p. 159.

[4] HL XXI, 216ff.

The poisonous maiden.

We may conclude our picture of the work's contents with two of its stories, namely, concerning the poisonous maiden and the Jew and the Magus. A beautiful maiden was sent from India to Alexander with other rich gifts. But she had been fed upon poison from infancy "until she was of the nature of a snake. And had I not perceived it," continues Aristotle in the Hebrew version, "for I suspected the clever men of those countries and their craft, and had I not found by tests that she would kill thee by her embrace and by her perspiration, she surely would have killed thee." [4] This venomous maiden is also alluded to in various medieval discussions of poisons. Peter of Abano mentions her in his *De venenis*.[5] Gilbert of England, following no doubt Gerard of Cremona's translation of Avicenna, cites Ruffus rather than the Pseudo-Aristotle concerning her and says nothing of her relations with Alexander, but adds that animals who approached her spittle were killed by it.[6] In *Le Secret aux philosophes,* a French work of the closing thirteenth century, where the story is told at considerable length, Socrates rather than Aristotle saves Alexander from the poisonous maid.[1]

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[1] Caps. 68 and 72 (BM IA. 10756); cap. 68 appears in Egerton 2676; cap. 72 in Gaster's text and in the Paris (1520) edition. I could not find the passage in BN 6584; Steele (1920) 134-5.

[2] BN 6584, fol. 20r-v; Egerton 2676, fols. 33v-34r; cap. 65 (BM IA. 10756); fols. 36v-37r (Paris 1520); Steele, 114-15.

[3] Gaster, 159-60; fol. 38r (Paris, 1520); Steele, 174.

[4] Gaster, p. 127; cap. 12 (Harvard copy); also in BM IA. 10756, and BN 6584, fol. 10r, where Aristotle seems to detect the venomous nature of the maiden by magic art—"Et nisi ego illa hora sagaciter inspexissem in ipsam et arte magica iudicassem . . ."; while it is her mere bite that kills men, as Alexander afterwards proved experimentally; Steele, 60.

[5] Cap. 3.

[6] Gilbertus Anglicus, *Compendium medicinae,* Lyons, 1510, fol. 348v.

The Jew and the Magus.

In the other story a Magus is represented in a much more favorable light than magicians generally were; he seems to represent rather one of the Persian sages. He was traveling on a mule with provisions and met a Jew traveling on foot. Their talk soon turned to their respective religions and moral standards. The Magus professed altruism; the Jew was inclined to get the better of all men except Jews. When these principles had been stated, the Jew requested the Magus, since he professed to observe the law of love, to dismount and let him ride the mule. No sooner had this been done than the Jew, true to his law of selfishness and hate, made off with both mule and provisions. This misfortune did not lead the Magus to lose his faith in God, however, and as he plodded along he by and by came again upon the Jew who had fallen off the mule and broken his neck. The Magus then mercifully brought the Jew to the nearest town where he died, while the king of the country made the Magus one of his trusted ministers of state.[2]

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[1] HL XXX, 569ff. "Die Sage vom Giftmädchen" is the theme of a long monograph by W. Hertz, *Gesammelte Abhandlungen* (1905), pp. 156-277.

[2] BN 6584, fol. 27; IA. 10756, cap. 68; also in Paris, 1520 edition, etc.; Steele, 144-6.

CHAPTER XLIX

SOLOMON AND THE ARS NOTORIA

Solomon as a magician—Magic books ascribed to Solomon—Manuscripts of them—Notory art of Solomon and Apollonius—Other works ascribed to Solomon and Apollonius—*Liber sacratus;* preface—*Incipit* and *Explicit*—A work of theurgy or the notory art—Character of its contents—The third "work"—The fourth and fifth "works"—How to operate with spirits—The seal of the living God—Spirits of Saturn.

Solomon as a magician.

It was only natural that Solomon, regarded as the wisest man in the history of the world, should be represented in oriental tradition as the worker of many marvels and that in the course of time books of magic should be attributed to him, just as treatises on the interpretation of dreams were ascribed to Joseph and Daniel. Roger Bacon speaks of the magic books in a grand-sounding style which were falsely ascribed to Solomon and which "ought all to be prohibited by law." [1] Solomon's reputation as a magician, even in the western Latin-speaking world, was much older than the thirteenth century, however. In 1918 Roman archaeologists excavated at Ostia a bronze disc, on one side of which was depicted Solomon as a magician, stirring with a long ladle some mess in a large cauldron. On the other side of the disc was a figure of the triple Hecate, who, like Solomon, was surrounded by mystic signs and magic characters.[2]

Magic books ascribed to Solomon.

But to return to the medieval period. In the first half of the thirteenth century William of Auvergne, bishop of Paris, in his treatise on laws declares that there is no divinity in the angles of Solomon's pentagon, that the rings of Solomon and the seals of Solomon and the nine candles (*candariae*) are a form of idolatry, and involve execrable consecrations and detestable invocations and images. "As for that horrible image called the *Idea Salomonis et entocta,* let it never be mentioned among Christians." In the same class are the book called *Sacratus* and the figure *Mandel* or *Amandel.*[1] Some years later Albertus Magnus, listing evil books of necromantic images in his *Speculum astronomiae,*[2] includes five treatises current under the name of Solomon, and seems to have in mind about the same works as William. One is *De figura Almandel,* another *De novem candariis,* and a third on the four rings (*De quatuor annulis*) opens with the words *"De arte eutonica et ideica,"* which remind one of William's *"Idea Salomonis et entocta,"* and is perhaps also identical with a *Liber de umbris idearum* cited under the name of Solomon by Cecco d'Ascoli in his necromantic commentary upon the *Sphere* of Sacrobosco,[3] written in the early fourteenth century.

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[1] Brewer (1859), pp. 526, 531.

[2] *The Nation,* New York, May 10, 1919, p. 744. In January, 1922, it was announced that a paper by Professor C. C. McCown, "Solomon as a Magician in Christian Legend," would appear in the *Journal of the Palestine Oriental Society.*

Manuscripts of them.

Moreover, these same works are apparently still extant in manuscripts in European libraries. The figure Almandal or Almandel and the rings of Solomon are found in fifteenth century manuscripts at Florence and Paris,[4] while in the Sloane collection of the British Museum we find Solomon's pentagon, the divine seal, the four rings, and the nine candles, all in seventeenth century manuscripts.[5] In these seventeenth century manuscripts also appear, and more than once, the *Clavicula* or Key of Solomon, in French, Italian, and English,[1] the book by Solomon called *Cephar* or *Saphar Raziel*,[2] and the *Liber sacer* or *sacratus*.[3] The last-named work, mentioned at least twice in the thirteenth century by William of Auvergne, who calls it "a cursed and execrable book," [4] is also found in manuscripts of the fourteenth or fifteenth century,[5] and we shall presently consider it in particular as a specimen of the Pseudo-Solomon literature and of medieval books of magic, theurgy, and necromancy.

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[1] *De legibus,* cap. 27.

[2] Cap. 11.

[3] Ed. of 1518, p. 22F2.

[4] Florence II-iii-24, 15th century, 74-77, "Liber in figura Almandel et eius opere / et eius iuditio"; 77, "Alius liber de Almandal qui dicitur tabula vel ara Salomonis."

BN 7349, 15th century, #8, Annuli Salomonis.

[5] Sloane 3851, fols. 31v-53, "Signum Pentaculum Salomonis"; 3853, fol. 127v, Divine seal of Solomon; 3847, fols. 66v-81, "Opus mirabile et etiam verissimum de quatuor annulis sapientissimi Salomonis"; 3850, fols. 68-75, Salomonis opus de novem candariis celestibus. In a 16th century MS in French there is a book of conjurations of spirits ascribed to Solomon. The conjurations themselves are mainly in Latin. CU Trinity 1404 (VI).

Notory art of Solomon and Apollonius.

Let us first, however, note some other works ascribed to Solomon and which have to do with the *Ars Notoria*, or Notory Art, which seeks to gain knowledge from or communion with God by invocation of angels, mystic figures, and magical prayers. We are told that the Creator revealed this art through an angel to Solomon one night while he was praying, and that by it one can in a short time acquire all the liberal and mechanical arts.[6] There seems to be little difference between the notory art of Solomon, that of

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[1] Harleian 3536, in French; Sloane 1307, in Italian, the translation being ascribed to "Gio. Peccatrix"; Sloane 3825 and 3847 are not identical versions.

[2] Sloane 3826, fols. 1-57; 3846, fols. 127-55; 3847, fols. 161-88; 3853, fols. 41-53. Perhaps the same as the "Sefer ha-Yashar" mentioned by Haya Gaon in the early eleventh century: Gaster, *The Sword of Moses*, 1896, p. 16.

[3] Sloane 3883, fols. 1-25, De modo ministrandi librum sacrum (revealed to Solomon by an angel).

Sloane 3885, fols. 1-25, "Liber sacer Salomonis," repeated at fols. 96v-125; fols. 58-96, Tractatus de re magica ab Honorio filio Euclidis magistro Thebarum ex septem voluminibus artis magicae compilatus, et intitulatus Liber sacer, sive juratus.

[4] *De legibus*, caps. 24 and 27.

[5] Sloane 313, late 14th or 15th century (according to a Letter from Dr. Montague Rhodes James to me, dated 21 May, 1921), mutilus, quondam Ben Jonsonii, 26 fols., Salomonis opus sacrum ab Honorio ordinatum, tractatus de arte magica.

Sloane 3854, 14th century, fols. 112-39, Honorii Magistri Thebarum liber cui titulus "Juratus."

[6] BN 7153, 15th century, Solomon, Sacratissima ars notoria.

Harleian 181, fol. 18-, Ars notoria (Salomoni ab angelo tradita) preceded at fol. 1- by Ars memorativa, and followed at fol. 81 by "de arte crucifixa."

CU Trinity 1419, 1600 A. D., Liber de Arte memorativa sive notoria . . . Prologus per Sallomonem . . . Inc. sanctissima Ars notoria quam Creator altissimus per Angelum suum super altare templi quodam modo Salomoni dum oraret ministrans.

Math. 50 (Amplonius' catalogue of 1412), "Item liber continens septem libros parciales qui dicitur angelus magnus vel secreta secretorum et est de arte notoria Salomonis et non debet rudibus exponi.

CLM 19413, 10-11th century, fols. 67-108, Salomonis III formulae, might turn out to be a work on Notory Art.

Solomon, Machineus, and Euclid,[1] and the *Golden Flowers* of Apollonius,[2] in which Solomon is mentioned almost every other sentence. Cecco d'Ascoli may have had it in mind when he cited the *Book of Magic Art* of Apollonius and the *Angelic Faction* of the same author.[3] In one manuscript at the close of the *Golden Flowers* of Apollonius are prayers which one "brother John Monk" confesses he himself has composed in the years 1304-1307.[4] In a later manuscript we find his prayers described as given to him by the blessed God and as "perfect science," and they are followed by "The Pauline art," discovered by the Apostle Paul after he had been snatched up to the third heaven, and delivered by him at Corinth.[5] Other works of notory art are listed in the manuscript catalogues without name of author.[6] But all alike are apt to impress the present reader as unmeaning jumbles of diagrams and magic words.[7] We shall sufficiently illustrate them all when we come to speak of the *Liber sacratus* which is itself in large measure concerned with the Notory Art.

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[1] Sloane 1712, 13th century, fols. 1-22, "Ars notoria Salomonis, Machinei, et Euclidis," followed at fols. 22-37 by an anonymous "ars notoria quae nova ars appellatur."

BN 7152, 14th century, Expositiones quas Magister Apollonius flores aureos ad eruditionem et cognitionem omnium scientiarum et naturalium artium generaliter et merito et competenter appellavit; hoc opus Salomonis Machinei et Euclidii actoritate maxima compositum et probatum est: accedunt figurae.

[2] CLM 268, 14th century, 16 fols.; CLM 276, 14th century, fols. 1-26, Apollonii flores aurei, quorum pars extat in cod. 268.

Amplon. Quarto 380, 13th century, fols. 49-64, ars notoria Appolonii philosophi et magi; while the 1412 catalogue gives Math. 54, "Liber Appollonii magi vel philosophi qui dicitur Elizinus"; Amplon. Octavo 84, 14th century, fols. 95-106 (Apollonii) de arte notoria Salomonis.

Ashmole 1515, 16th century, fol. 4r, "Incipit primus tractatus istius sanctissime artis notorie et expositiones eius et temporum exceptiones, quas Salomon et Apollonius flores aureos appellaverunt, et hoc opere probatum est et confirmatum authoritate Salomonis, Manichei et Euduchii."

[3] *Sphere* (1518), fol. 3.

[4] CLM 276, fol. 49.

[5] BN 7170A, 16th century, # 1, de arte notoria data a Deo beato Joanni Monacho sive de scientia perfecta: praemittuntur orationes decem; # 2, Ars Paulina, a Paulo Apostolo inventa post raptum eius et Corinthiis denotata.

[6] BN 9336, 14th century, "Sacratissima ars notoria."

Amplon, Quarto 28, anno 1415, fols. 38-41, ars notoria et orationibus et figuris exercenda; Amplon. Octavo 79, 14th century, fols. 63-64, ars notoria brevis et bona.

Sloane 3008, 15th century, fol. 66-, de arte notoria, brief and illegible.

[7] Essentially similar is *"The Sword of Moses.* An ancient book of magic from an unique manuscript, with introduction, translation, an index of mystical names and a facsimile. Published for the first time," London, 1896, by M. Gaster from a Hebrew MS

Other works ascribed to Solomon and Apollonius.

Certain works may be mentioned which are ascribed to Solomon or to Apollonius in the medieval manuscripts, and which do not seem to be concerned with the notory art. Experiments ascribed to Solomon will be mentioned in another place in connection with experimental literature. Treatises of alchemy and astrology also were attributed to him.[1] Under the name of Apollonius we find a work on the properties or occult virtue of things, and another, or possibly the same, on the principal causes of things.[2] One wonders if it may have any connection with the book on six principles of things ascribed to Hermes Trismegistus and which has been discussed in our chapter on *Hermetic Books in the Middle Ages*. A treatise on palmistry is ascribed to Solomon in a fourteenth century manuscript at Cambridge.[3] A "Philosophy of Solomon" in a manuscript of the late twelfth century in the British Museum consists of "notes perhaps from more than one source on the analogy between the patriarchs Abraham, Isaac, and Jacob, the three divisions of philosophy (*moralis, naturalis, inspectiva*), and the three books of Solomon."[4]

Liber sacratus: preface.

The *Liber sacratus,* as William of Auvergne twice entitles it, or the *Liber sacer* or *Liber juratus,* as it is also

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of 13-14th century. Gaster (p. 18) describes the treatise as "a complete encyclopaedia of mystical names, of eschatological teachings, and of magical recipes." The *Sword* proper is a series of names.

[1] Sloane 3849, 15-16th century, fols. 30-38, A noble experiment of King Solomon with astrological tables.

Ashmole 1416, 15th century, fol. 113v, Libellus de sulphuris virtutibus; 114-, Fragmentum de planetarum influentia; 123-, On perilous days; 123-4, Ars artium, or prayers to invoke spirits, is perhaps a portion of the *Ars Notoria*.

[2] Vienna 3124, 15th century, "Verba de proprietatibus rerum quomodo virtus unius frangitur per alium. Adamas nec ferro nec igne domatur / cito medetur."

BN 13951, 12th century, Liber Apollonii de principalibus rerum causis.

[3] Trinity 1109, fols. 388-90, Expl. tract. de Palmistria Salamonis. The tract consists of two full page diagrams and an explanation in French.

[4] Royal 7-D-II, late 12th century, fols. 3-10, opening, "Hanc ergo triplicem divine philosophie formam. . . ." I quote the description in the new catalogue of the Royal MSS.

called in the manuscripts,[1] is associated with the name Honorius as well as Solomon, and is often spoken of as *The Sworn Book of Honorius.* The preface, as given in the Latin manuscripts of the fourteenth century—one of which once belonged to Ben Jonson—states that under the influence of evil spirits the pope and cardinals had passed a decree aiming at the complete extirpation of the magic art and condemning magicians to death. The grounds for this action were that magicians and necromancers were injuring everyone, transgressing the statutes of holy mother church, making invocations and sacrifices to demons, and dragging ignorant people down to damnation by their marvelous illusions. These charges the magicians hotly deny as inspired by the envy and cupidity of the devil who wished to keep a monopoly of such marvels. The magicians declare that it is impossible for a wicked or impure man to work truly by the magic art, in which they assert that the spirits are compelled against their will by pure men. The magicians further profess to have been forewarned by their art of this legislation against them. They hesitate, however, to summon the demons to their aid lest those spirits avail themselves of the opportunity to destroy the populace utterly. Instead an assembly of 89 masters from Naples, Athens, and Toledo has chosen Honorius, son of Euclid,[2] a master of Thebes, to reduce their magic books to one volume containing 93 chapters, which they may more readily conceal and preserve. And inasmuch as it has pleased the prelates and princes to order the burning of their books and the destruction of schools of magic, the followers of that art have taken an oath not to give this volume to anyone until its owner is on his death-bed, never to have more than three copies of it made at a time, and never to give it to a woman or to a man who is not of mature years and proved fidelity. Each new recipient of the sacred volume is also to take this oath.

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[1] See above, page 281 of this chapter, notes 3 and 5.

[2] Possibly he is the same Euclid as one of the three co-authors of the work on the *Notory Art* mentioned above.

Hence the name, *Juratus* or *Sworn-Book.* Its other titles, *Sacer* or *Sacratus,* refer either to the sacred names of God which constitute much of its text or to its consecration by the angels.

Incipit and *Explicit.*

After this proemium, which, like the magic art itself, is probably more impressive than true, the work proper opens with the statement, "In the name of almighty God and Jesus Christ, one and true God, I, Honorius, have thus ordered the works of Solomon in my book." Later Honorius reiterates that he is following the precepts and in the foot-prints of Solomon, whom he also often cites or quotes in course. The *Explicit* of the *Sworn-Book* is unusually long and sets forth in grandiloquent style the purpose of the volume.

"So ends the book of the life of the rational soul,[1] which is entitled *Liber sacer* or *The Book of the Angels* or *Liber juratus,* which Honorius, Master of Thebes, made. This is the book by which one can see God in this life. This is the book by which anyone can be saved and led beyond a doubt to life eternal. This is the book by which one can see hell and purgatory without death. This is the book by which every creature can be subjected except the nine orders of angels. This is the book by which all science can be learned. This is the book by which the weakest substance can overcome and subjugate the strongest substances. This is the book which no religion possesses except the Christian, or if it does, does so to no avail. This is the book which is a greater joy than any other joy given by God exclusive of the sacraments. This is the book by which corporeal and visible nature can converse and reason with the incorporeal and invisible and be instructed. This is the book by which countless treasures can be had. And by means of it many other things can be done which it would take too long to enumerate; therefore it is deservedly called *The Holy Book.*"

A work of theurgy or the notory art.

From this description it will be seen that the work has a good deal to do with the so-called Notory Art. Moreover, in the manuscript copy said to have belonged to Ben Jonson the word *Theurgia* is written on the fly-leaves before the beginning and after the close of the text. This calls to mind the passage in *The City of God*[1] where Augustine speaks of "incantations and formulae composed by an art of depraved curiosity which they either call magic or by the more detestable name *goetia* or by the honorable title *theurgia.* For they try to distinguish between these arts and condemn some men, whom the populace calls *malefici,* as devoted to illicit arts, for these, they say, are concerned with *goetia;* but others they want to make out praiseworthy as being engaged in theurgy. But they are both entangled in the deceptive rites of demons who masquerade under the names of angels."

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[1] One wonders if this can be the evil book of magic referred to by Roger Bacon and other writers as *De morte animae.*

Character of its contents.

The text is full of the names of spirits, prayers in strange words, supposedly derived from Hebrew or Chaldaic, and other gibberish. Series of letters and figures often occur and names inscribed in stars, hexagons, and circles. An English translation in a fifteenth century manuscript[2] is adorned with pictures of rows of spirits dressed like monks in robes and caps but with angelic wings. The text does not seem to be complete in any of the manuscripts that I have examined,[3] but Sloane 3854 of the fourteenth century contains an apparently complete table of contents. The chapter headings, anyway, are more intelligible than the jargon of the text. The first chapter deals with the composition of the great name of God which contains 72 letters. The second is about the divine vision and by the time it is finished we are nearly two-thirds through the space allotted to the *Liber juratus* in one manuscript. The third chapter is on knowledge of the divine power, the fourth on absolution from sin, the fifth deals with mortal sin, the sixth with the redemption of souls from purgatory. With this the "first work" of the collection of Honorius ends. The opening chapters of the second work discuss the heavens, the angels found in each heaven and at the four points of the compass, their names and powers, seals and virtues, and invocation. Chapters 14 and 15 tell how to get your wish from any angel or to acquire the sciences. Chapter 16 tells how to learn the hour of one's death, and chapter 17 how to know all things, past, present, or future. It was perhaps these chapters that William of Auvergne had in mind when, in censuring works on divination by inspection of mirrors, sword-blades, and human nails to discover stolen articles and other hidden things, he added that "from this pest of curiosity proceeded that accursed and execrable work called *Liber sacratus*."[1] That work next returns for three chapters to the stars and planets and their virtues and influence. Chapter 21 then instructs how to turn day into night or night into day. Next spirits are further considered, those of air and those of fire, their names and their superior spirits, their powers, virtues, and seals. Attention is then given to the four elements and bodies composed thereof, to herbs and plants, and to human nature, after which aquatic and terrestrial spirits are discussed. The future life is then considered and the 33rd chapter, which is the last one of the "second work," deals with "the consecration of this book."

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[1] *De civitate Dei,* X, 9.

[2] Royal 17-A-XLII.

[3] Sloane 313 seems to reach only as far as the early chapters of the "second work."

The third "work."

The "third work," which extends from chapter 34 to 87 inclusive, treats of the control of spirits by words, by seals, by tables, and by shutting them up. It tells how to provoke thunder and lightning, storms, snow, ice, rain, or dew; how to produce flowers and fruit; how to become invisible; how to wage war and to make an indestructible castle, how to destroy a town by means of mirrors; how to sow discord or concord, how to open closed doors, to catch thieves, fish, and animals, and to produce varied apparitions.

The fourth and fifth "works."

The fourth work deals with similar marvels but it is stated that two of its chapters, namely, 91 on the apparition of dead bodies which speak and seem to be resuscitated, and 92 on the apparent creation of animals from earth, will be omitted as contrary to the will of God. The fifth work or book, which seems to coincide with the 93rd and last chapter of Honorius, is in reality divided into five chapters, which return to themes similar to those of the first work.

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[1] *De legibus*, cap. 24, p. 68 in ed. of 1591.

How to operate with spirits.

To illustrate further the character of the work a few particular passages may be noticed. We are told that there are three ways of operating by means of spirits: the pagan, Jewish, and Christian. The pagans sacrificed to spirits of earth and air but did not really constrain them. The spirits only pretended to be coerced in order to encourage such idolatrous practices. "Whoever wishes to operate by such experiments" (mark the word!), "deserts the Lord God." As for the Jews, they get along only so-so, and "do in no wise work to obtain the vision of the deity." Only a Christian, therefore, can operate successfully in such visions. "And although three kinds of men work at this art of magic, one should not think that there is any evil included in this name of *magus,* for a *magus per se* is called a philosopher in Greek, a scribe in Hebrew, and a sage in Latin." [1]

The seal of the living God.

Very elaborate directions are given for the composition of the seal of the living God. Circles are drawn of certain proportions emblematic of divine mysteries, a cross is made within, numerous letters are written down equidistant from one another. A pentagon and two hexagons have to be placed just so in relation to one another; characters are inscribed in their angles; and various sacred names of God, Raphael, Michael, and other angels are written along their sides. Different parts must be executed in different colors; a particular kind of parchment must be employed; and the blood of a mole or hoopoe or bat must be used as ink for some of the writing. Finally, there are sacrifices, purifications, suffumigations, invocations, and prayers to be performed and offered. This seal, we are told, "will conquer the celestial powers, subjugate the aerial and terrestrial together with the infernal; invoke, transmit, conjure, constrain, excite, gather, disperse, bind, and restore unharmed;

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[1] Sloane 3854, fol. 114r.

will placate men and gain petitions from them graciously, pacify enemies,"[1] etc., etc.

Spirits of Saturn.

The spirits associated with the planet Saturn are Bohel, Casziel, Uuchathon, and Dacdel. Their nature is to cause sadness and wrath and hate, to produce ice and snow. Their bodies are long and large, pale or golden. Their region is in the north and they have five or nine demons under them.[2] As a rule spirits of the north and south are ferocious, those of the east and the west gentle.[3]

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[1] Sloane 3854, fols. 114r-115v.

[2] *Ibid.*, fol. 129v; Royal 17-A-XLII, fol. 67v.

[3] Sloane 3854, fol. 132r.

CHAPTER L

ANCIENT AND MEDIEVAL DREAM-BOOKS

Oneirocritica of Artemidorus—Astrampsychos and Nicephorus—Achmet translated by Leo Tuscus—Byzantine and oriental divinations by Daniel—Latin *Dream-Books of Daniel*—*Sompniale dilucidarium Pharaonis*—An anonymous exposition of dreams—Physiological origin of dreams—Origin and justification of the art of interpretation—Sources of the present treatise—Demoniac and natural causes of dreams—Interpretation—William of Aragon on prognostication from dreams—Who was William of Aragon?—His work formerly ascribed to Arnald of Villanova—Another anonymous work on dreams.

Oneirocritica of Artemidorus.

Both Jews and Greeks at the beginning of the Christian era were much given to the interpretation of dreams. There were "established and frequented dreaming places" at the shrines of Asclepius at Epidaurus, Amphiaraus at Oropus, Amphilochus at Mallos, Sarpedon in the Troad, Trophonius at Lebedea, Mopsus in Cilicia, Hermonia in Macedon, and Pasiphaë in Laconia. We hear of dream-books by Artemon, Antiphon, Strato, Philochoros, Epicharmus, Serapion, Cratippus, Dionysius of Rhodes, and Hermippus of Beirut. But the chief work upon the interpretation of dreams which has reached us from the time of the Roman Empire is that of Artemidorus, who was born at Ephesus and lived in Lydia in the time of the Antonines. He of course wrote in Greek and, despite the superstitious character of his work, in a pure and refined Attic style. The 'Ονειροκριτικά has also been translated into Latin, French, and Italian.[1] It is a compilation in five books gathered from previous literature on the subject and by the author personally in travel in Greece, Italy, and elsewhere. The first thirteen chapters of the fourth book, which Artemidorus opens with a general instruction to his son, deal with such preliminary and general considerations as the different types of dreams and more especially those divinely sent, the significance of times, the personal qualifications requisite in the interpreter, and certain rules of interpretation such as that native customs are good signs and foreign ways bad signs in dreams. But the great bulk of the work consists of specific interpretation arranged either under topical headings such as "Concerning Nativity," or listed as single dreams.

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[1] Cockayne, *Anglo-Saxon Leechdoms*, RS vol. 35, 1864-1866, III, x. The 'Ονειροκρίτικα was printed by the Aldine press at Venice, 1518; a Latin translation by Cornarius appeared at Basel, 1539; it was published in both Latin and Greek by N. Rigaltius at Paris, 1603; the modern edition is by R. Hercher, Leipzig, 1864.

I have not seen P. Diepgen, *Traum und Traumdeutung als medizinisch-naturwissenschaftliches Problem im Mittelalter,* Berlin, 1912.

Astrampsychos and Nicephorus

In the edition of 1603 [1] the work of Artemidorus is followed by much briefer metrical treatises on the same subject by Astrampsychos and Nicephorus.[2] These poems, if they may be so called, devote a line of interpretation to each of the things seen in dreams, and these verses are arranged in alphabetical order. This was to be the method of arrangement adopted in the medieval dream-books ascribed to the prophet Daniel. Astrampsychos is first named by Diogenes Laertius [3] in the early third century. He was supposed to have been one of the Persian Magi, and other occult treatises are ascribed to him, including astrological writings, a book of oracles addressed to Ptolemy, and love charms in a papyrus in the British Museum.[4]

Achmet translated by Leo Tuscus.

Still another work on the interpretation of dreams contained in the edition of 1603 [5] is ascribed to "Achmet, the son of Sereim" or Ahmed ben Sirin.[1] The Greek text states that he was interpreter of dreams to Mamoun, the first minister of the Caliph, which fixes his date as about 820 A. D.[2] Perhaps he is the same Achmet who wrote an astrological treatise extant in Greek which he says he compiled from books from Adam's time to the present day.[3] Of the work on dreams there is a Latin version in the medieval manuscripts translated from the Greek by Leo Tuscus,[4] who died in 1182 and was interpreter of imperial letters in the time of the Byzantine emperor, Manuel Comnenus. Leo prefixes to his translation a prologue addressed [5]

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[1] Its full title reads: *Artemidori Daldiani et Achmetis Sereimi F.* (*filius*) *Oneirocritica. Astranpsychi et Nicephori versus etiam Oneirocritici. Nicolai Rigaltii ad Artemidorum Notae.* Paris. 1603.

[2] They cover only twenty pages in large type as against the 269 pages of small type of *Artemidorus. Astrampsychos* was also published at Amsterdam in 1689 with the *Oracula Sibyllina* by S. Gallaeus.

[3] Proem. 2.

[4] Papyrus 122.

[5] See note 1 on this page. The work was previously printed at Frankfort under the title *Apomasaris Apotelesmata* or *Predictions of Albumasar.* There is some matter missing at the beginning of both of these editions of the work.

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[1] Rigaltius, however, states that Achmet's name did not appear in either of the two Latin MSS at Paris which he used, nor in the Greek one; but the opening of his text, as just stated in the previous note, seems defective.

On Ahmed ben Sirin see: Drexl, *Achmets Traumbuch* (*Einleitung und Probe eines kritischen Textes*), Munich dissertation, 1909; and articles by Steinschneider in *Zeitschrift d. deutsch. Morgenl. Gesellschaft*, XVII, 227-44, and *Vienna Sitzungsberichte, Phil-hist. Kl.* CLXIX, 53 and CLI, 2: cited by Haskins (1918), p. 494, note 12.

[2] Krumbacher (1897), p. 630.

[3] *Cat. Cod. Astrol. Graec.*, II, 122, Achmet, *De introductione et fundamento astrologiae.* ἡ ποίησις τούτου τοῦ τοιούτου βιβλίου ἐκ τῶν βιβλίων τῶν Περσῶν ὅ ἐποίησεν ὁ Ἀχμάτης, ὅστις ὡς ἔφη συνῆξε τὰ βιβλία τὰ εὑρισκόμενα ἀπὸ τοῦ Ἀδὰμ μέχρι τῆς αὐτοῦ ἡμέρας.

Since this astrological work mentions Albumasar, while Achmet, the author of the dream-book, wrote early in the ninth century, the editors of the *Catalogus* doubt if the two Achmets are the same, but it should be noted that in the astrological treatise Achmet is spoken of in the third person and that it may be a re-editing of his original work. On the other hand, perhaps this astrological Achmet is Alphraganus, or Ahmetus filius Ahmeti (Ameti), as he is often called.

[4] C. H. Haskins, *Leo Tuscus,* in EHR (1918), pp. 492-6. Leo's activity as a translator is further attested by BN 1002, "Liturgia sancti Joannis Chrysostomi," printed in Claudius de Sainctes, *Liturgiae sive Missae Sanctorum Patrum*, Antwerp, 1562, fol. 49.

[5] Haskins, *op. cit.,* prints the prologue from the first of the following MSS of Leo's Latin translation.

Digby 103, late 12th century, fol. 59-, "Ad Hugonem Ecerialium doctorem suum et utraque origine fratrem Leo Tuscus imperatoriarum epistolarum interpres de sompniis et oraculis." "Explicit liber sompniorum Latine doctus loqui a Leone Thusco imperialium epistolarum interprete temporibus magni imperatoris Manuel." Neither this Titulus to the prologue nor this Explicit appears in the printed edition of 1603.

Wolfenbüttel 2917, 13-14th century, fols. 1-20, "Ad Hugonem Eteriarium doctorem summum et utraque origine fratrem Leo Tuscus imperatoriarum epistolarum interpres de somniis et oraculis. Quamquam, optime preceptor, invictum imperatorem Manuel sequar per fines Bithinie Licaonieque fugantem Persas." Haskins (1918), p. 494, shows that this statement applies to the year 1176 rather than 1160-1161 as scholars have previously held.

Haskins also lists the following

to his brother Hugo Eterianus or Eteriarius (Ecerialius). This work of Achmet is of about the same length as that of Artemidorus and contains over three hundred chapters. It is or pretends to be drawn mainly from Indian, Persian, and Egyptian sources and often cites in turn the doctrine or interpretation of those three peoples, or mentions by name interpreters of dreams of the kings and pharaohs of those countries.[1] The preface states that the same dream must be interpreted differently in the case of king and commoner, of rich and poor, and according to sex. The time of the dream must also be taken into account. For example, to see a tree blossom is a good sign in spring but a bad omen in autumn. The hour of the night when the dream occurs and the phases of the moon are other time factors which must be reckoned with. The remainder of the treatise is devoted to specific interpretation of dreams.

Byzantine and oriental divinations by Daniel.

To Joseph and Daniel, as the chief Biblical interpreters of dreams, books on the subject were assigned in the middle ages, as John of Salisbury has informed us. Daniel, however, seems to have been the greater favorite. Liutprand the Lombard, who died in 972, says in the account of his embassy to Constantinople, "The Greeks and Saracens have books which they call the *horaseis,* or Visions, of Daniel, but I should call them Sibylline. In them is found written how many years each emperor will live, and what will be the character of his reign, whether peace or strife, whether favorable or hostile relations with the Saracens." [2]

MSS: Harleian 4025, fols. 8-78; Ashmole 179; Vatic. Lat. 4094, fols. 1-32v; but does not mention these:

BN 7337, 15th century, pp. 141-61, which has the same Titulus and includes the prologue, a table of 198 chapters, and the text as far as the 37th chapter, De ventre.

Vienna 5221, 15th century, 136 fols., "Laborans laboraui inveniendum . . . / . . . huiusmodi egritudinem jnueniret. Explicit liber sompniorum latine doctus loqui a leone Imperialium epistolarum interprete temporibus Magni Imperatoris Manuel."

[1] Preface, "ac primo quidem secundum Indorum doctrinam, deinde Persarum, tum denique Aegyptiorum"; cap. 2, "Strbachan regis Indorum interpres ait"; cap. 3, "Baram Interpres Saanissae Persarum regi"; cap. 4, "Tarphan Interpres Pharaonis regis Aegyptiorum."

[2] Quoted by Haskins and Lockwood, *The Sicilian Translators,* 1910, p. 93, from the *Legatio,* ed. Dümmler, Hanover, 1877, pp. 152-3.

A brief set of Greek verses in alphabetical order ascribed to the emperor Leo, which occur in a late manuscript with various works of the fathers, seem to resemble the Latin alphabetical dream-books of which we shall presently treat.[1] Works of divination were also attributed to Daniel in Syriac and Arabic, such as predictions of rain, hail, and the like for each day of the year, and of eclipses and earthquakes,[2] or astrological forecasts for each month of the year.[3] There is even a geomancy in Turkish ascribed to the prophet Daniel.[4]

Latin *Dream-Books of Daniel.*

Dream-Books ascribed to the prophet Daniel are found in Latin manuscripts at least as early as the tenth century, and continue through the fifteenth century despite the denial of their authenticity by John of Salisbury in the twelfth century. At least three different types of *Dream-Books of Daniel* are represented in incunabula editions in the British Museum.[5] The *Dream-Book of Joseph* occurs with less

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[1] BN 3282, 17th century, fols. 27v-29r, Leonis (sapientis) imp. versus alphabetici de futuro judicio.

[2] Bodleian 3004, #15 (Qu. Catal. VI, Syriac, #161), Arabice literis Syriacis.

[3] Alger 1517 and 1518, in Arabic but according to the months of the Syrian year.

[4] Additional 9702.

[5] *Sōnia Daniel'* (IA.8754), "Danielis somniorum expositoris veridici libellus incipit. . . . Ego sum daniel propheta unus de israhelitis qui captivi ducti sunt. . . ."

Somnia Danielis et Ioseph (IA.31744), "Omnes prophete tradebant somnia que videbant in somniis eorum et solus propheta Daniel filius Iude qui captus a rege Nabuchudonosor. . . ." This is followed by a second treatise which opens, "Incipiunt somnia quae composuit Joseph dum captus erat a rege Pharaone in egypto. . . ."

Interpretationes somniorum Danielis prophete revelate ab angelo misso a deo (IA.11607, and IA.18164 is very similar).

The Incipit in the second edition is given in more nearly correct form in Sloane 3281, 13-14th century, fol. 39r, "Omnes homines tradebant sompnia que tradebant (?) ut solveret propheta daniel. . . ."

Another opening, found in the MSS, states that the princes of Babylonia asked the prophet Daniel to interpret their dreams. See Digby 86, late 13th century, fols. 34v-40r, "Daniel propheta petebatur a principiis civitatis Babilone ut somnia que eis videbantur solvere (solveret?). Tunc sedit et hec omnia scribat (et) tradidit populo ad legendum." The first two lines of interpretation are:

"Arma in somniis portare securitatem significat;
Arcum tendere et sagittas mittere lucrum vel laborem significat."
("To bear arms in dreams signifies security;
To draw bow and shoot arrows signifies gain or labor.")

Bodleian 177 (Bernard 2072), late 14th century, fol. 64r, opens frequency.[1] These Latin *Dream-Books* do not go into details of politics like the Byzantine books which Liutprand described. The simplest form, which we have already mentioned in speaking of the Moon-Books of the tenth and eleventh centuries, is according to the days of the moon.[2] It is often embodied in the fuller versions. Their usual arrangement is an alphabetical list of objects seen in dreams with a line of interpretation for each and perhaps a page for each letter of the alphabet. Sample lines are:

> *Aerem serenum videre lucrum significat*
> ("To see a clear sky signifies gain")
> *Intestina sua videre secreta manifesta*
> ("To see one's own intestines means secrets revealed")

This alphabetical arrangement already appears in the early manuscripts.[3] Sometimes, however, the procedure is by opening the Psalter at random, taking the first letter on the page opened to, and then referring to a list where the letters of the alphabet have various significations, such as "A signifies power of delight," "B signifies victory in war."[4] This last method might, of course, be employed without having any dream at all, and perhaps should not be regarded as a Dream-Book. It is interesting to note that in one manuscript it is called *Experiments of Daniel.* In these books of

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somewhat differently, "Danielem prophetam cum esset in Babilonia petebant principes," and its first two lines of interpretation are:

"Aves cum se pugnare videre fecundiam significat;
Aves in sompniis apprehendere lucrum significat."
("To see birds fight among themselves signifies fecundity;
To catch birds in one's dreams signifies gain.")

[1] For a printed edition see the second item in the preceding note.

CLM 7806, 14th century, fol. 153, where as in the printed edition it follows a *Dream-Book of Daniel.*

Vatican Palat. 330, 15th century, fol. 303v.

[2] For instance, Chartres 90, end of tenth century, fol. 16, "Somnium Danielis prophete. Luna I. Quidquid videris ad gaudium pertinet. Luna II et III et IIII. Bonus affectus erit," etc.

[3] Tiberius A-III, fols. 25v-30v; Titus D-XXVI, fols. 11v-16r; Sloane 475, fols. 217v-218r, breaking off in the midst of the letter B. In Harleian 3017, fol. 1v-, however, the lines of interpretation are not in alphabetical order.

[4] This is the method in the second part of the printed edition numbered IA.8754 in the British Museum. See also: BN 7453, 14th century, #3, Ars psalterii a Daniele inventa; BN 7349, 15th century, Danielis experimenta sive modus divinandi ad aperturam psalterii et conjiciendi per somnia.

Daniel further instructions are sometimes given, as when it is stated that dreams which occur before midnight are of no value for purposes of interpretation, or when one is told before opening the Psalter to repeat on bended knees a Lord's Prayer, *Ave Maria,* and *Miserere.* Days to be observed are also sometimes mentioned as a sort of accompaniment to the *Dream-Book:* forty dangerous days "which the masters of the Greeks have tested by experiment," [1] "bromantic days" from the twenty-fourth of November to the eighteenth of December, and "perentalic days" from the first of January to the first of March. "And these are the days when the leaves fall from the trees," which is apparently supposed to have a disturbing effect upon the clarity of dreams.[2]

Sompniale dilucidarium Pharaonis.

A Sompniale dilucidarium Pharaonis, as it is entitled in the manuscript of it which I have examined,[3] or *Morale somnium Pharaonis,* as it is called in the printed editions,[4] was addressed by a John of Limoges [5] to Theobald, King of Navarre and Count of Champagne and Brie, who died in 1216.[6] It is really not a Dream-Book but a series of imaginary and fulsomely rhetorical letters between Pharaoh and his Magi, Pharaoh and Joseph, and Joseph and adulators and detractors. John states in his introductory letter to Theobald that the famous dream of Pharaoh will here be "morally expounded concerning royal discipline." Pharaoh typifies any curious king; Egypt stands for any studious kingdom; Joseph represents any virtuous counselor; and the dream will be interpolated with flowers of rhetoric and theology.

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[1] Ashmole 361, 14th century, fols. 158v-159.

[2] Sloane 3281, fol. 39r; also in IA.31744, except that the names are misspelled.

[3] St. John's 172, 15th century, fols. 99v-123, where the work is rather appropriately preceded by two treatises on Ars dictaminis. Our author, according to Fabricius, *Bibl. Med. et Inf. Lat.*, Padua, 1754, IV, 90, also wrote *De Stylo dictionario.* Other MSS of the *Sompniale* are CUL Dd. iv. 35, 15th century, fols. 49r-73v, and Ii. vi. 34.

[4] The first 18 letters were printed at Altdorf, 1690, by J. C. Wagenseil, and in Fabricius, *Cod. Pseud. Vet. Test.*, 1713, I, 441-96. For letters 19 and 20 see Fabricius, *Bibl. Med. et Inf. Lat.*, 1754, IV, 91-4.

[5] Joannes Lemovicensis; but Fabricius calls him "Joannes a Launha, Lemovicensis." Steele (1920) p. ix, calls him "Jean de Launha or de Limoges."

[6] Steele (1920) p. ix, however, says, "but modern scholars put the date as about 1250, a much more probable one." Steele does not add his references or reasons for this statement.

An anonymous *Exposition of Dreams.*

More elaborate and making more pretense to philosophical character than the brief Dream-Books of Daniel is an anonymous work on dreams contained in a Paris manuscript of apparently the later part of the thirteenth century.[1] It is the first treatise in the manuscript, which further contains two important works of the first half of the twelfth century, namely, the *Imago mundi* of Honorius of Autun and the *De philosophia* of William of Conches. The texts of these two latter works are much cut up and intermixed with each other. It is therefore not unlikely that the opening treatise on dreams is also a work of the twelfth century, although there does not seem to be much reason for ascribing it either to Honorius of Autun or William of Conches. A long *prohemium* fails to throw much light upon the personality of the author, but the work does not seem to be a translation. That it is not earlier than the twelfth century is indicated by its citation of the *Viaticum* and *Passionarius,* presumably the well known medical works of Constantine Africanus and Gariopontus,[2]—unless indeed it be by Constantinus himself, to some of whose views it shows a resemblance.

Physiological origin of dreams.

The preface opens by stating that a desirable treasure lies hidden in the heart of the wise but that it is of no utility unless it is revealed. In other words, dreams must be interpreted. The author regards dreams, like thoughts in general, as beginning with the *spiritus* which rises from the heart and ascends through two arteries to the brain.[1] Our author perhaps still holds to Aristotle's view of the importance of the heart in the nervous system as against Galen's exclusive emphasis upon the brain, since he allots the heart a share even in mental processes; and he seems to be ignorant of Galen's discovery that the arteries contain blood and not *spiritus*.

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[1] BN 16610, fols. 2r-24r, *Expositio somniorum.* It opens, "Thesaurus occultus requiescit in corde sapientis et immo desiderabilis sed in thesauro occulto et in sapientia abscondita nulla pene utilitas ergo revelanda sunt abscondita et patefacienda que sunt occulta." It closes, ". . . ventus si flavit in hyeme calidus fructus frugisque in illo loco erit copia frigidus et acer (?) ventus in hyeme visus per sompnium contrarium in messe significat si frigidus. Explicit expositio somniorum."

The mistakes made in the text in such matters as case-endings and abbreviations indicate that our MS is not by the hand of the author but by that of some later and careless copyist. A number of corrections of the text have been made in the margin or between the lines, and apparently the same hand has written in the margin or between the lines a number of headings to indicate the contents. These occur chiefly, however, towards the close of the work.

[2] BN 16610, fol. 7v, "Fiunt preterea sompnia secundum qualitates ciborum et humorum a quibus et certissima signa ut diximus cuiusque infirmitatis capiuntur sicut in viatico et passionario demonstrantur."

Origin and justification of the art of interpretation.

The preface goes on to justify the study of dreams on the ground that "the most ancient Magi and perfect physicians" thereby adjudged to each man health and sickness, life and death. "Medicine and divine thoughts, dreams, visions, or oracles are not prohibited, but demoniacal incantations, sorcery, lot-castings, insomnia, and vain phantasms are condemned that you may not readily trust in them." [2] No doctrine is to be spurned wholesale, but only what is vicious in it. Shadrach, Meshach, and Abednego excelled all the Magi and soothsayers of the Chaldeans. Our author explains that among the Chaldeans then as today learning consisted not of the philosophy and sophistry of the Greeks and Latins, but of astronomy and interpretations of dreams. He alludes to a prayer of seven verses which they repeat when going to bed in order to receive responses in dreams. They pay little heed to the superficial meaning of their dreams, but by examining the inner meaning they learn either past or future. The author exhorts the person to whom he addresses the preface to do the same, laying aside all terrors that dreams may arouse in him. He points out that interpretation of dreams has Biblical sanction and that Joseph, Daniel, and Marduch all profited thereby.

Sources of the present treatise.

As for the present treatise, it is collected from divine and human scripture, based upon experience as well as reason, and drawn from Latins, Greeks, Persians, and the annals of Pharaoh and Nebuchadnezzar in which many of their dreams are recorded, for they were both lovers of the future and, since they had no philosophers like the Gentiles, God allowed them as a compensation to foresee the future in dreams. For by dreams life and death, poverty and riches, sickness and health, sorrow and joy, flight and victory, are known more easily than through astrology, a more difficult and manifold art.[1] But lest his introduction grow too long, the author at this point ends it and begins the text proper.

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[1] The point is repeated in the text proper at fol. 4r. In the preface at fol. 2r the author also states that a small boy can be put into a stupor when standing up, by pressing his arteries between the thumb and forefinger so that "the vapor of the heart cannot ascend to the brain."

[2] *Ibid.*, fol. 3r.

Demoniac and natural causes of dreams.

After stating what a dream is, the author discusses the origin and causes of dreams further. Some are from the devil or at least are influenced by demons, as when a monk was led to become a Jew by a dream in which he saw Moses with a chorus of angels in white, while Christ was surrounded by men in black. But when we see chimeras in dreams, this is generally due to impurity of the blood. The author also opines that, while the sage can judge from the nature of the dream whether there is fallacy and illusion of the demon in it, the origin of virtues and vices is mainly in ourselves. He who goes to sleep with an easy conscience is unlikely to be disturbed by nightmares and is more likely in quiet slumber to behold secrets and mysteries. The author next discusses the effect of the passions and exercise of the mental faculties upon the liver, heart, and brain. He adopts the common medieval view that the brain contains three ventricles devoted respectively to imagination, reason, and memory. He explains that the so-called *incubus,* popularly thought of as a dwarf or satyr who sits on the sleeper, is really a feeling of suffocation produced by blood-pressure near the heart. The interpretation of a dream must vary according to the social rank of the person concerned. As images in a mirror deceive the ordinary observer but are readily accounted for by the geometer, and as the philosopher notes the significations of other planets than the sun and moon, whose effects alone impress tne vulgar herd, so there are dreams which only a skilled interpreter can explain. Dreams are affected by food and by the humors prevailing in the body, and also by the occult virtues of gems, of which a list is given from "Evax" or Marbod.[1]

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[1] BN 16610, fol. 3v.

Interpretation.

The second book takes up again the varying significations of dreams according to the person concerned, and also the significance of the time of the dream. The four seasons, the phases of the moon, nativity of the dreamer, and hour of the night are discussed. The remaining two-thirds of the treatise consists in stating the interpretation to be placed upon the varied persons and things seen in dreams, beginning with God and Jesus Christ, and continuing with crucifixes, idols, statues, bells, hell, the resurrection of the dead, and so on and so forth. Early mention of eunuchs and icons suggests a Byzantine source. More especially in the last third of the treatise, various marginal headings indicate that the interpretations are "according to the Indians" or "according to the Persians and Egyptians," which suggests that use is being made of the work of Achmet or of Leo Tuscus' translation thereof.

William of Aragon on prognostication from dreams.

The influence of Achmet's work is also seen in a treatise on the prognostication of dreams compiled by master William of Aragon.[2] It opens by referring to the labors in this art of the ancient philosophers of India, Persia, Egypt, and Greece, and later it cites Smarchas the Indian,[3] whom I take to be the same as the Strbachan of Achmet's second chapter. William justifies writing his treatise by saying that while there may be many Dream-Books in existence already, they are mere *Practice* and without reason, while he intends to base the prediction of the future from dreams upon rational speculation, and to support his particular reasoning by specific examples.[1] He makes more use of Aristotle's classification of dreams [2] than the anonymous work just considered, from which he further differs in dwelling more upon the connection of dreams with the constellations.[3] The second part of his treatise consists of twelve chapters devoted to the twelve astrological houses.[4] Earlier he mentions that at the nativity of Alexander an eagle with extended wings rested all day on the roof of the palace of his father Philip.[5] In stating the signification of various objects William has a chapter on what different parts of the human body signify when seen in dreams.[6] Like our previous works on divination from dreams, he lays considerable stress upon experience, illustrating his statement that dreams are often due to bodily ills by cases which "I have seen," [7] and also asserting that it is shown by experience that dreams seen on the first four days of the week are most quickly fulfilled.[8]

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[1] BN 16610, fols. 4r-8r. In my summary I have followed the order of the text for the first book.

[2] BN 7486, fols. 2-16r, "Incipit liber de pronosticationibus sompniorum a magistro Guillelmo de aragonia compilatus. Philosophantes antiquos sive yndos sive persos sive egyptios sive grecos." St. John's 172, early 15th century, fols. 140-52, where it appears anonymously.

It is listed in the 15th century catalogue of MSS in St. Augustine's Abbey, Canterbury, 1545, Tractatus W. de Arrogon de interpretatione sompniorum.

[3] Simarchardus, as printed in the works of Arnald of Villanova.

Who was William of Aragon?

This William of Aragon is no doubt the same who commented upon the *Centiloquium* ascribed to Ptolemy.[9] From his medical experience and his tendency to give an astrological explanation for everything one is tempted to identify him further with the William Anglicus or William of Marseilles who wrote the treatise of astrological medicine entitled, *Of Urine Unseen,* in the year 1219, but it is of course unlikely that the same man would be called of Aragon as well as of England and Marseilles or that the words *Anglicus* and *Aragonia* should be confused by copyists.

His work formerly ascribed to Arnald of Villanova.

The treatise on dreams has been printed among the works of Arnald of Villanova,[10] a physician who interpreted dreams for the kings of Aragon and Sicily at the end of the thirteenth century, under the title *Expositio* (or, *Ex-*

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[1] St. John's 172, fol. 140v.

[2] BN 7486, fols. 3v-4r.

[3] *Ibid.,* fols. 4v-6v.

[4] *Ibid.,* fols. 10r-16r.

[5] *Ibid.,* fol. 6r.

[6] *Ibid.,* fol. 7v.

[7] *Ibid.,* fol. 9r.

[8] *Ibid.,* fol. 9v.

[9] Harleian 1, 13-14th century, fol. 76v-.

[10] See below for a chapter concerning him.

positiones) *visionum quae fiunt in somniis.*[1] The *Histoire Littéraire de la France*[2] has noted that in the manuscript copies the work was anonymous and not ascribed to Arnald, but I believe that I am the first to identify it with the work of William of Aragon.

Another anonymous work on dreams.

In the same manuscript with the *Sompniale dilucidarium Pharaonis* and the work of William of Aragon on dreams just described is another long anonymous work on the interpretation of dreams.[3] It makes the usual points that the meaning of dreams varies with times and persons. But the treatise consists chiefly[4] of a mass of significations which are not even arranged in alphabetical order, a failing which it is attempted to remedy by an alphabetical index at the close.[5]

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[1] In the edition of Lyons, 1532, at fols. 290-2.

[2] HL 28, 76-7.

[3] St. John's 172, fols. 153-209r, "Summus opifex deus qui postquam homines ad ymaginem suam plasmaverit animam rationalem eidem coniunxerit ratione cuius malum a bono discernit suum creatorem laudando unde anima futura in sompniis comprehendit sive bonum sive malum in posterum futurum. . . ."

[4] Ibid., fols. 153v-208v.

[5] Ibid., fols. 209v-212r.

BOOK V. THE THIRTEENTH CENTURY

Foreword
Chapter 51. Michael Scot.
" 52. William of Auvergne.
" 53. Thomas of Cantimpré.
" 54. Bartholomew of England.
" 55. Robert Grosseteste.
" 56. Vincent of Beauvais.
" 57. Early Thirteenth Century Medicine: Gilbert of England and William of England.
" 58. Petrus Hispanus.
" 59. Albertus Magnus.
  I. Life.
  II. As a scientist.
  III. His allusions to magic.
  IV. Marvelous virtues in nature.
  V. Attitude toward astrology.
" 60. Thomas Aquinas.
" 61. Roger Bacon.
  I. Life.
  II. Criticism of and part in medieval learning.
  III. His experimental science.
  IV. Attitude toward magic and astrology.
  V. Conclusion.
" 62. The Speculum Astronomiae.
" 63. Three Treatises Ascribed to Albert.
" 64. Experiments and Secrets of Galen, Rasis, and Others: I. Medical and Biological.

Chapter 65. Experiments and Secrets of Galen, Rasis, and Others: II. Chemical and Magical.
" 66. Picatrix.
" 67. Guido Bonatti and Bartholomew of Parma.
" 68. Arnald of Villanova.
" 69. Raymond Lull.
" 70. Peter of Abano.
" 71. Cecco d'Ascoli.
" 72. Conclusion.

BOOK V. THE THIRTEENTH CENTURY

FOREWORD

In our preceding book on the twelfth century we included some writers, like Alexander Neckam, who lived on a few years into the following century but whose works were probably written in the twelfth. We now, with Michael Scot, begin to treat of authors whose period of literary productivity dates after 1200. We shall endeavor to consider the various authors and works in something like chronological order, but this is often difficult to determine and in one or two cases we shall purposely disregard strict chronology in order to bring works of the same sort together. Our last four chapters on Arnald of Villanova, Raymond Lull, Peter of Abano, and Cecco d'Ascoli carry us over the threshold of the fourteenth century, the death of the last-named not occurring until 1327.

Greater voluminousness and thoroughness mark the work of these writers as compared with those of the twelfth century. The work of translation has been partly accomplished; that of compilation, reconciliation, criticism, and further personal investigation and experimentation proceeds more rapidly and extensively. The new Friar Orders invade the world of learning as of everything else: of the writers whose names head the following chapters Bartholomew of England and Roger Bacon were Franciscans;[1] Thomas of Cantimpré, Vincent of Beauvais, Albertus Magnus, and Thomas Aquinas were Dominicans. In these representatives of the new religious Orders, however, theology cannot be said to absorb attention at the expense of natural science. The prohibitions of the study of the works of Aristotle in the field of natural philosophy by the University of Paris early in the century preceded the friars and were not lasting, and the mid-century struggle of the friars with the other teachers at Paris [1] was one over privilege and organization rather than tenets. Teachers and writers were, however, sometimes condemned for their intellectual views at Paris and elsewhere in the thirteenth century, and whether the study of natural science and astrology was persecuted is a question which will arise more than once. In any case the friars seem to have declined in scientific prowess as in other respects toward the close of the century. Petrus Hispanus, who became Pope John XXI in 1276-1277, had not been a friar himself, and is said to have been more favorable to men of learning than to the regular clergy. Finally, in Guido Bonatti, Arnald of Villanova, Peter of Abano, and Cecco d'Ascoli we come to laymen, physicians and astrologers, who were to some extent either anti-clerical themselves or the object of clerical attack.

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[1] Little that is new on the theme of the Franciscans and learning is contributed by H. Felder, *Geschichte der wissenschaftlichen Studien im Franziskanerorden bis um die Mitte des 13 Jahrhunderts,* Freiburg, 1904.

This was the century in which Roger Bacon launched his famous eulogy of experimental science. A good-sized fleet of passages recognizing its importance will be found, however, in our other authors, and we shall need to devote two chapters to experimental books which were either anonymous or pretended to date back to ancient or Arabic authors. And not without some justification, since we have been tracing the history of experimental science through our previous books.

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[1] Concerning it consult F. X. Seppelt, *Der Kampf der Bettelorden an die Universität Paris in der Mitte des 13 Jahrhunderts*, Breslau, 1905, in *Kirchengesch. Abhandl.*, III; or H. Rashdall, *The Universities of Europe in the Middle Ages*, I, v, 2, "The Mendicants and the University"; or P. Feret, *La faculté de théologie de Paris: moyen âge*, Paris, 1894-1897, 4 vols.; and other works listed by Paetow (1917), p. 441.

CHAPTER LI

MICHAEL SCOT

Bibliographical note—Michael Scot and Frederick II—Some dates in Michael's career—Michael Scot and the papacy—Prominent position in the world of learning—Relation to the introduction of the new Aristotle—Thirteenth century criticism of Michael Scot—General estimate of his learning—God and the stars—A theological digression—The three Magi—Astrology distinguished from magic—The magic arts—Experiments of magic—History of astronomy—The spirits in the sky, air, and earth—Occult medicine—The seven regions of the air—Michael's miscellaneous content—Further astrological doctrine—Omission of nativities—Magic for every hour—Quaint religious science—The *Phisionomia*—Influence of the stars on human generation—Discussion of divination—Divination from dreams—Works of divination ascribed to Michael Scot—Medical writings—Occult virtues—Astrology in the *Commentary on the Sphere*—Dionysius the Areopagite and the solar eclipse during Christ's passion—Alchemy—Works of alchemy ascribed to Michael Scot—Brother Elias and alchemy—*Liber luminis luminum* and *De alchemia*—Their further characteristics.

Michael Scot and Frederick II.

BUT little can be said with certainty concerning the life of Michael Scot.[1] However, a poem by Henry of Avranches,

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[1] James Wood Brown, *An inquiry into the life and legend of Michael Scot,* Edinburgh, 1897. While this book has been sharply criticized (for instance, by H. Niese in HZ, CVIII (1912), p. 497) and has its failings, such as an unsatisfactory method of presenting its citations and authorities, it gives, obscured by much verbiage intended to make the book interesting and popular and much fanciful speculation as to what may have been, a more reliable account of Michael's life and a fuller bibliography of his writings than had existed previously. But it must be used with caution.

Liber introductorius: extant only in MSS, of which some are:

Bodleian 266, 15th century, 218 fols. "Quicumque vult esse bonus astrologus . . . / . . . finitur tractatus de notitia pronosticorum." This is the MS which I have used.

CLM 10268, 14th century, 146 fols. Described by F. Boll (1903), p. 439. I tried to inspect this MS when I was in Munich in 1912 but it had been loaned out of the library at that time.

Brown further mentions BN nouv. acq. 1401 and an Escorial MS of the 14th century which I presume is the same as Escorial F-III-8, 14th century, fols. 1-126, "Incipit prohemium libri introductorii quem edidit Michael Scotus," etc.

The following are perhaps extracts from the *Liber Introductorius:*

BN 14070, 13th-14th-15th century, fol. 112-, Mich. Scoti de notitia conjunctionis mundi terrestris cum celesti; fol. 115-, Eiusdem de presagiis stellarum.

Vienna 3124, 15th century, fols. 206-11, "Capitulum de hiis quae generaliter significantur in partibus duodecim celi sive domibus."

Vatican 4087, fol. 38r, "Explicit liber quem edidit micael scotus de signis et ymaginibus celi."

See also MSS mentioned by Brown at p. 27, note 2.

Liber particularis, or *Astronomia;* also extant only in MSS.

Canon. Misc. 555, early 14th century, fols. 1-59. "Cum ars astronomie sit grandis sermonibus philosophorum. . . . This is the MS I have used; others are:

Escorial E-III-15, 14th century, fols. 41-51, Michaelis Scoti ars astronomiae ad Federicum imperatorem II.

CLM 10663, 18th century, 261 fols., Michael Scot, Astronomia.

At Milan, Ambros. L. 92.

Phisionomia: eighteen editions are said to have appeared between 1477 and 1660. I have used the following text:

Michael Scot, *De secretis naturae,* Amsterdam, 1740, where it follows at pp. 204-328 the *De secretis mulierum* and other treatises ascribed to Albertus Magnus.

It occurs at fols. 59-88 of Canon. Misc. 555, immediately after the *Liber particularis,* and is found in other MSS.

Commentary on The Sphere of Sacrobosco.

Eximii atque excellentissimi physicorum motuum cursusque siderei indagatoris Michaelis Scoti super auctorem sperae cum questionibus diligenter emendatis incipit expositio confecta Illustrissimi Imperatoris Dñi D. Fedrici precibus, Bologna, 1495. I have also used an edition of 1518, and there are others.

Liber lumen luminum.

Riccardian 119, fols. 35v-37r, "Incipit liber luminis luminum translatus a magistro michahele scoto philosopho."

Printed by Brown (1897), Appendix III, pp. 240-68.

I presume it is the same as the *Lumen luminum* ascribed to Rasis in BN 6517 and 7156—see Berthelot (1893), I, 68—but I have not compared them.

In the same Riccard. 119 at fol. 166r is a Liber lumen luminum ascribed to Brother Elias, general of the Franciscans. "Incipit liber alchimicalis quem frater helya edidit apud fredericum Imperatorem. Liber lumen luminum translatus de sarraceno ac arabico in latinum a fratre cypriano ac compositus in latinum a generali fratrum minorum super alchimicis. Incipit liber qui lumen luminum dicitur ex libris medicorum et experimentis et philosophorum et disciplinarum ex(t)ranearum."

De alchimia (or, *alchemia*)

Corpus Christi 125, fols. 97v-100v, Michaelis Scoti ad Theophilum Saracenorum regem "de alkemia." "Explicit tractatus magistri michaelis Scoti de alke."

The above-mentioned books and manuscripts are those especially discussed and utilized in the present chapter. The following may be noted, since they are omitted by Brown, although they have little to do with our investigation:

Mensa philosophica. Of this brief work ascribed to Michael Scot several incunabula exist in the library of the British Museum.

Amplon. Folio 179, 14th century, fols. 98-99, "Liber translative theologie de decem kathegoriis." The attribution of this addressed to the emperor Frederick II in 1235 or 1236,[1] shows that Michael was then dead and that he apparently had occupied the position of astrologer at the court of Frederick II at the time of his death. The poet explains how astrologers (*mathematici*) "reveal the secrets of things," by their art affecting numbers, by numbers affecting the procession of the stars, and by the stars moving the universe. He recalls having heard "certain predictions concerning you, O Caesar, from Michael Scot who was a scrutinizer of the stars, an augur, a soothsayer, a second Apollo"; and then tells how "the truthful diviner Michael" ceased to publish his secrets to the world, and "the announcer of fates submitted to fate," apparently in the midst of some prediction made on his death-bed. Michael's own statements also show that he was one of Frederick's astrologers.[2] If at the time of his death Michael was Frederick's astrologer, it is more questionable at what date his association with Frederick began, and in what countries Michael resided with the emperor, or accompanied him to, whether Sicily, southern Italy, northern Italy, or Germany. From the fact that three of Michael Scot's works, or rather, the three chief divisions of his longest extant work,[3] namely, *Liber Introductorius, Liber Particularis,* and *Phisionomia,* were written at the request of Frederick II for beginners [4] and apparently in the time of Innocent III,[5] J. Wood Brown jumped to the conclusion that Michael was Frederick's tutor before that monarch came of age, and that he spent some time in the island of Sicily, from which Brown failed to distinguish

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to Michael Scot might be taken to support the tradition that he was a doctor of theology at Paris.

[1] The poem is printed in *Forschungen zur deutschen Geschichte,* XVIII (1878), p. 486. Yet Cantor II (1913), p. 7, has Michael outlive Frederick and transfer his residence to the court of Edward I of England.

[2] Canon. Misc. 555, fol. 44v, "Quadam vice me michaelem scotum sibi fidelem inter ceteros astrologos domestice advocavit."

[3] That they are sections of one work is made clear from his statement at the end of the long preface to all three: Bodleian 266, fol. 25v; Boll (1903), p. 439, quotes the same passage from CLM 10268.

[4] "Scolares novitii."

[5] The MSS say "Innocent IV," but Michael had died before his pontificate.

Frederick's larger kingdom of Sicily.[1] As a matter of fact, there would seem to be rather more evidence for connecting Michael with Salerno than with any Sicilian city, since in one manuscript of his translation for the emperor of the work of Avicenna on animals he is spoken of as "an astronomer of Salerno," [2] while in another manuscript he is associated with a Philip, clerk of the king of Sicily, and this royal notary in two deeds of 1200 is called Philip of Salerno.[3] Brown was inclined to identify him further with Philip of Tripoli, the translator of the pseudo-Aristotelian *Secret of Secrets.*

Some dates in Michael's career.

No date in Michael's career before the thirteenth century is fixed. If it is true that the three sections of his main work were written under Innocent III, that places them between 1198 and 1216. The date of his translation of the astronomical work of Alpetragius or Alpetrangi (Nûr ed-dîn el-Betrûgî, Abû Ishâq) seems to have been in the year 1217 on Friday, August 18, in the third hour and at Toledo.[4]

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[1] Brown (1897), chapter II. Criticized by H. Niese in *Historische Zeitschrift,* vol. 108 (1912), p. 497, note 3.

[2] Bologna University Library 693, 16th century, "Michaelis Scoti astronomi Salernitani liber de animalibus. Incipit liber primus de animalibus Avicenne rubrica. Frederice domine mundi Romanorum Imperator, suscipe devote hunc laborem Michaelis Scoti."

[3] Laurentian P. lxxxix, sup. cod. 38, 15th century, p. 409; printed in Brown (1897), pp. 231-4. Concerning Philip see also Brown, pp. 19, 36-7. The important passage in the MS is, "Explicit nicromantiae experimentum illustrissimi doctoris Domini Magistri Michaelis Scoti, qui summus inter alios nominatur Magister, qui fuit Scotus, et servus praeclarissimo Domino Philipo Regis Ceciliae coronato; quod destinavit sibi dum esset aegrotus in civitate Cordubae, etc. Finis." Brown, p. 19, translates the last clause, "which experiment he (i. e., Michael) contrived when he lay sick in the city of Cordova," and so concludes that Scot visited that city; but I should translate it, "which he (Michael) sent to him (Philip) while he (Philip) lay sick in the city of Cordova." Otherwise why is Philip mentioned at all?

[4] Brown, p. 104, citing Jourdain, *Recherches,* p. 133, who called attention to two Paris MSS, Anciens fonds 7399 and Fonds de Sorbonne 1820, in one of which the MS is dated 1217, while the other gives the year as 1255 which is the exactly corresponding year of the Spanish era. Arsenal 1035, 14th century, fol. 112, a MS not noted by Jourdain or Brown, states the year as 1207 A. D., but this is evidently a mistake for 1217, since it gives the same day of the week and month as the other MSS and August 18th fell on Friday in 1217, but not in 1207. BN 16654, 13th century, fol. 33, gives the date as 1217.

Brown holds that Michael translated Avicenna on animals in 1210 for Frederick II and that the emperor kept it to himself until 1232, when he allowed Henry of Cologne to copy it.[1] But the date 1210 perhaps applies only to a glossary of Arabic terms which accompanies the work and which is ascribed to a "Master Al." [2] In a thirteenth century manuscript at Cambridge Michael Scot's translation of Aristotle's *History of Animals* is accompanied by a note which begins, "And I Michael Scot who translated this book into Latin swear that in the year 1221 on Wednesday, October twenty-first," [3] The note and date, however, do not refer to the completion of the translation but to a consultation in which a woman showed him two stones like eggs which came from another woman's womb and of which he gives a painstakingly detailed description. There is, however, something wrong with the date, since in 1221 the twenty-first of October fell on Thursday.[4]

Michael Scot and the papacy.

The career of Michael Scot affords an especially good illustration of how little likelihood there was of anyone's being persecuted by the medieval church for belief in or practice of astrology. Michael, although subordinating the stars to God and admitting human free will, as we shall see, both believed in the possibility of astrological prediction and made such predictions himself. Yet he was a clergyman, perhaps even a doctor of theology,[5] as well as a court astrologer, and furthermore was a clergyman of sufficient rank and prominence to enable Pope Honorius III to procure in 1224 his election to the archbishopric of Cashel in Ireland.[6] At the same time the papal *curia* issued a dispensation permitting Michael to hold a plurality, so that he evidently already occupied some desirable benefice. Michael declined the archbishopric of Cashel, on the ground that he was ignorant of the native language but perhaps because he preferred a position in England; for we find the papacy renewing its efforts in his behalf, and Gregory IX on April 28, 1227, again wrote to Stephen Langton, archbishop of Canterbury, urging him to make provision for "master Michael Scot," whom he characterized as "well instructed not only in Latin but also in the Hebrew and Arabic languages." [1]

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[1] P. 55, arguing from a Vatican MS which is described at pp. 235-7.

[2] "Glosa magistri al. Explicit anno domini mccx."

[3] Gonville and Caius 109, fols. 102v-103r, written in a different hand from the text of the *History of Animals*, "Et iuro ego michael scotus qui dedi hunc librum latinitati quod in anno MCCXXI, xii kal. novembr. die mercurii. . . ."

[4] Perhaps the year is correct, but "xii kal." should be "xiii kal."

[5] HL XX, 47; Brown (1897), p. 14; both citing Du Boulay, *Hist. univ. Paris.*, 1656-1675.

[6] See Denifle et Chatelain, *Chartularium Universitatis Parisiensis*, 1889, I, 104, for a letter of Honorius III of January 16, 1224, asking Stephen Langton, archbishop of Canterbury, to secure a benefice for Michael Scot whom

Prominent position in the world of learning.

Whether Michael ever secured the additional foreign benefice or not, he seems to have remained in Italy with Frederick until the end of his days. He also seems to have continued prominent among men of learning, since in 1228 Leonardo of Pisa dedicated to him the revised and enlarged version of his *Liber abaci*,[2] important in connection with the introduction of the Hindu-Arabic numerals into western Europe.

Relation to the introduction of the new Aristotle.

Roger Bacon in the *Opus Maius* [3] in a passage often cited by historians of medieval thought ascribes the introduction of the new Aristotle into western Latin Christendom to Michael Scot who, he says, appeared in 1230 A. D. with portions of the works of Aristotle in natural philosophy and metaphysics. Before his time there were only the works on logic and a few others translated by Boethius from the Greek; since 1230 the philosophy of Aristotle "has been magnified among the Latins." Although many writers have quoted this statement as authoritative in one way or another, it must now be regarded as valuable only as one more illustration of the loose and misleading character of most of

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he calls "singularly gifted in science among men of learning": and Theiner, *Vetera Monumenta Hibernorum et Scotorum*, Rome, 1864, p. 23, for a letter of Honorius III of June in the same year, stating that Michael has declined the archbishopric of Cashel and appointing another man. Brown has incorrectly dated both letters in 1223.

[1] Denifle and Chatelain, I, 110.

[2] For the date and MSS see Boncompagni, *Intorno ad alcune opere di Leonardo Pisano*, Rome, 1854, pp. 2 and 129-30.

[3] Bridges (1897) I, 55; in Jebb's edition, pp. 35-6.

Roger's allusions to past learning and to the work of previous translators. We know that the books of Aristotle on natural philosophy had become so well known by that time that in 1210 the study of them was forbidden at the university of Paris, and that about that same year, according to Rigord's chronicle of the reign of Philip II, the books of Metaphysics of Aristotle were brought from Constantinople, translated from Greek into Latin, and began to be read at Paris.[1] But Bacon's date is more than twenty years too late, and we have already mentioned the translation of *The Secret of Secrets,* which Bacon regarded as genuine, the acquaintance of Alexander Neckam with works of Aristotle, Alfred of England's translation of the *De vegetabilibus* and of three additional chapters to the *Meteorology,* the still earlier translation of the rest of that work by Aristippus from the Greek and by Gerard of Cremona from the Arabic, and Gerard's numerous other translations of works of Aristotle in natural philosophy. The translations of Gerard and Aristippus take us back to the middle of the twelfth century nearly a century before the date set by Bacon for the introduction of the new Aristotle.[2] Michael Scot, then, did not introduce the works of Aristotle on natural science and Bacon's chronological recollections are obviously too faulty for us to accept the date 1230 as of any exact significance in even Michael's own career, to say nothing of the history of the translation of Aristotle.

This is not to say that Michael was not of some importance in that process, since he did translate works of Aristotle and his Arabic commentators, especially Avicenna and Averroes. Frederick II is sometimes said to have ordered the translation from Greek and Arabic of such works of

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[1] *Rigordus de Gestis Philippi II;* quoted in the Leo XIII edition of Aquinas, Rome, 1882, vol. I, p. cclix, "legi Parisiis coepisse libellos quosdam aristotelis, qui docebant metaphysicum, de novo Constantinopoli delatos et a graeco in latinum translatos."

[2] P. Duhem, "Du temps où la Scolastique latine a connu la physique d'Aristote," in *Revue de philosophie,* August, 1909, pp. 163-78, argues that the *Physics* was known to Latins in the twelfth century.

Aristotle and other philosophers as had not yet been translated from Greek or Arabic.[1] But the letter which has been ascribed in this connection to Frederick is really by his son and successor, Manfred,[2] for whom many translations were made, including several Aristotelian treatises, genuine and spurious, by Bartholomew of Messina. Already, however, in 1231 and 1232 a Jew at Naples had translated Averroes' abridgement of the *Almagest* and his commentary on the *Organon,* in the latter extolling Frederick's munificence and love of science.[3] Michael Scot has been shown to have translated from the Arabic the *History of Animals* and other works on animals, making nineteen books in all, and also Avicenna's compendium of the same, the *De caelo et mundo,* the *De anima* with the commentary of Averroes, and perhaps the *Metaphysics* or part of it.[4] His translation of the *De caelo et mundo* was accompanied by a translation of Alpetrangi's commentary on the same.[5]

Thirteenth century criticism of Michael Scot.

Scholars of the succeeding generation sometimes spoke unfavorably of Michael's work. Although Roger Bacon recognized his translations as the central event in the Latin reception of the Aristotelian philosophy, and spoke of him as "a notable inquirer into matter, motion, and the course of the constellations,"[6] he listed him among those translators who "understood neither sciences nor languages, not even Latin," and charged more than once that a Jew named Andrew was really responsible for the translations credited to Michael.[7] Albertus Magnus asserted that Michael Scot "in reality was ignorant concerning nature and did not understand the books of Aristotle well."[1] Yet he used Michael's translation of the *Historia Animalium* as the basis of his own work on the subject, often following it word for word.[2] Michael was, however, listed or cited as an authority by the thirteenth century encyclopedists, Thomas of Cantimpré, Bartholomew of England, Vincent of Beauvais, and at the close of that century is frequently cited by the physician Arnald of Villanova in his *Breviarium practicae*.[3]

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[1] Petrus de Vineis III, ep. lxvii; Latin cited in Dissertation 23 in vol. I of the Rome, 1882, edition of the works of Aquinas. Frederick II is not even mentioned in Grabmann's dissertation on the translation of Aristotle in the thirteenth century. In the preface to his *De arte venandi cum avibus* Frederick refuses to follow Aristotle who, he says, had little or no practice in falconry: Haskins, EHR XXXVI (1921) 343-4.

[2] The letter of Manfred accompanied his gift to the University of Paris of copies of the translations made for him. See *Chartularium Universitatis Parisiensis,* I, 435-6.

[3] Renan, *Averroès et Averroïsme,* p. 188.

[4] Grabmann (1916), pp. 143-4, 175-6, 186-7, 198.

[5] BN 17155, 13th century, fol. 225-.

[6] Brown, 145.

[7] Brown, 119, Brewer (1859), p. 91.

General estimate of his learning.

Michael Scot may be said to manifest some of the failings of the learning of his time in a rather excessive degree. His mind, curious, credulous, and uncritical, seems to have collected a mass of undigested information and superstition with little regard to consistency or system. Occasionally he includes the most childish and naïve sort of material, as we shall illustrate later. He continues the Isidorean type of etymology, deriving the name of the month of May, for example, either from the majesty of Jupiter, or from the major chiefs of Rome who in that month were wont to dedicate laws to Jupiter, or from the *maioribus* in the sense of elders as June is derived from Juniors.[4] He also well illustrates the puerilities and crudities of scholastic argumentation. Thus one of the arguments which he lists against regarding a sphere as a solid body is that solids can be measured by a straight line and that it cannot.[5] Asking whether fire is hot in its own sphere, he says that it might seem not, because fire in its own sphere is light and light is neither hot nor cold.[6] This argument he rebuts in the end, and he finally decides that a sphere is a solid. But he would have seemed wiser to the modern reader to have omitted these particular contrary arguments entirely. Such propositions continue, however, to be set up and knocked down again all through the thirteenth century, and such famous men as Thomas Aquinas and Peter of Abano are guilty of much the same sort of thing. To Michael Scot's credit may be mentioned his considerable power of experimentation and of scientific observation. Perhaps some of the "experiments" attributed to him are spurious, but they show the reputation which he had for experimental method, and on the whole it would seem to be justified. The note in his name in a thirteenth century manuscript at Cambridge,[1] giving a carefully dated and detailed account of two human foetuses which had solidified into stones like eggs, shows a keen sense of the value of thorough observation and a precise record of the same. Experimental science would seem to have received considerable encouragement at the court of Frederick II, judging from the stories told of that emperor and the pages of his own work on falconry.[2]

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[1] *Meteor.* III, iv. 26 (Borgnet, IV, 697).

[2] See Jourdain, *Recherches*, etc., and more recently H. Stadler, "Irrtümer des Albertus Magnus bei Benutzung des Aristoteles," in *Archiv f. d. Gesch. d. Naturwissenschaften u. d. Technik*, VI (1913) 387-93.

[3] De Renzi, I, 292.

[4] Canon. Misc. 555, fol. 6.

[5] *Sphere* (1518), p. 106.

[6] *Ibid.*, p. 107.

God and the stars.

But let us examine Michael's views and methods more particularly. In opening the long preface to his voluminous *Introduction to Astrology* he states that hard study is requisite to become a good astrologer, but he finds incentive to such effort in citations from Seneca, Cato, and St. Bernard that it is virtuous to study and to be taught, and in the reflection that one who knows the conditions and habitudes of the superior bodies can easily learn those of inferior bodies. The signs and planets are not first movers or first causes, and do not of themselves confer aught of good or evil, but by their motion do indicate "something of truth concerning every body produced in this corruptible world." The hour of conception is important and Michael explains why two persons born at the same moment may be unlike. He then jumbles together from Christian and astrological writers such assertions as that the stars are only signs, not causes, and that their influence on inferior creation may be compared to the action of the magnet upon iron, or that we see on earth good men suffer and bad men prosper, which has usually been regarded as a better argument for a fatalistic or mechanical universe than for divine control. He agrees that the universe is not eternal and that everything is in God's power, but insists that much can be learned concerning the future from the stars.[1]

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[1] Gonville and Caius 109, fol. 102v-103r.

[2] C. H. Haskins, "The 'De Arte Venandi cum Avibus' of the Emperor Frederick II," EHR XXXVI (1921) 334-55.

A theological digression.

Michael then embarks upon a long theological digression [2] in the course of which he quotes much Scripture concerning the two natures, angelic and human. After telling us of the nine orders of angels in the empyrean heaven, he deals with the process of creation, just as William of Conches and Daniel of Morley had done in their works of astronomy and astrology. In the first three days God created spiritual substances such as the empyrean heaven, angels, stars, and planets; in the other three days, visible bodies such as mixtures of the elements, birds, fish, and man. Michael also answers various questions such as why man was created last, although nobler than other creatures, what an angel is, whether angels have individual names like men, and much concerning the tenth part who fell. Perhaps the emperor Frederick is supposed to put these queries to Michael, but there seemed to be no indication to that effect in the manuscript which I examined. The reply to the question where God resides is, potentially everywhere but substantially in the intellectual or empyrean heaven.[3] Michael discusses the holy Trinity and thinks that we have a similitude of it in the rational soul in the three faculties, intellect, reason, and memory,[4] although he attempts no association of these with the three Persons as William of Conches imprudently did in the case of power, wisdom, and will. He indulges, however, in daring speculation as to where the members of different professions will go after they die. Philosophers, "who die in the Lord," will be located in the order of Cherubim, which is interpreted as plenitude of science; sincere members of religious orders and hermits will become Seraphim; while pope, emperor, cardinals, and prelates will enter the order of Thrones.[1] Michael also contributes the following acrostic of eight sins whose initials compose the word, "Diabolus":

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[1] Bodleian 266, fols. 1r-v. Future citations, unless otherwise specified, will be to this MS.

[2] It extends from fol. 2 to fol. 19.

[3] fol. 4r.

[4] fol. 10r.

Desperatio
Invidia
Avaritia
Blasphemia
Odium
Luxuria
Ventris ingluvies
Superbia.[2]

The three Magi.

In the course of the foregoing digression Michael inserted an account of the Magi and the star that appears to be based in part but with variations on the spurious homily of Chrysostom. He makes them three in number, one from Europe, Asia, and Africa respectively; and states that forewarned by Balaam's prophecy they met together annually for worship on the day of Christ's nativity, which they appear to have known beforehand. They stood in adoration for three days continuously on Mount Victorialis until on the third day they saw the star in the form of a most beautiful boy with a crown on his head. Then they followed the star upon dromedaries which, Michael explains, can go farther in a day than horses can in two months. Beside the star three suns arose that day at equal distances apart and then united in token of the Trinity; and Octavianus, emperor of the Romans, saw the Virgin holding the Child in the center of the sun's disk. As for the word *magus,* Michael explains that it has a threefold meaning,—which, however, has nothing to do with the Trinity,—namely: trickster, sorcerer, and wise man, and that the Magi who saw the star were all three of these until their subsequent conversion to Christianity.[3]

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[1] fols. 11v-12r.

[2] fol. 17v.

[3] fol. 3r-v.

Astrology distinguished from magic.

The remainder of Michael's lengthy and lumbering preface is largely occupied with the utility of astrology, which he often calls "astronomy" (*astronomia*), and differentiation of it from prohibited arts of magic and divination. While, however, he distinguishes these other occult arts from astrology, he affirms that nigromancers, practitioners of the notory art, and alchemists owe more to the stars than they are ready to admit.[1] He also distinguishes a superstitious variety of astrology (*superstitiosa astronomia*),[2] under which caption he seems to have in mind divination from the letters of persons' names and the days of the moon, and other methods in which the astronomer or astrologer acts like a geomancer or sorcerer or tries to find out more than God wills. Scot also distinguishes between *mathesis,* or knowledge, and *matesis,* or divination, and between *mathematica,* which may be taught freely and publicly, and *matematica,* which is forbidden to Christians.[3]

The magic arts.

Michael condemns magic and necromancy but takes evident joy in telling stories of magicians and necromancers and shows much familiarity with books of magic. He explains "nigromancy" as black art, dealing with dark things and performed more by night than day, as well as the raising of the dead to give responses, in which the nigromancer is deceived by demons.[4] He repeats Hugh of St. Victor's definition that the magic art is not received in philosophy, destroys religion, and corrupts morals. As he has said before, the *magus* is a trickster and evil-doer as well as wise in the secrets of nature and in prediction of the future.[5] Michael lists twenty-eight varieties or methods of divination. He believes that they are all true: augury by song of birds, interpretation of dreams, observance of days, or divination by holocausts of blood and corpses. But they are forbidden as infamous and evil. Later on, in the text itself, he returns to this point, saying that these methods of predicting the future are against the Christian Faith, but nevertheless true, like the marvels of Simon Magus.[1] Michael defines and describes various magic arts in much the same manner as Isidore, Hugh of St. Victor, and John of Salisbury; but with some divergences. Under aerimancy he includes divination from thunder, comets, and falling stars, as well as from the shapes assumed by clouds. Hydromancy he calls "a short art of experimenting" as well as divining. The gazing into clear, transparent, or liquid surfaces for purposes of divination is performed, he says, with some observance of astrological hours, secrecy, and purity by a child of five or seven years who repeats after the master an incantation or invocation of spirits over human blood or bones. He speaks of a *maleficus* as one who interprets characters, phylacteries, incantations, dreams, and makes ligatures of herbs. The *praestigiosus* deceives men through diabolic art by phantastic illusions of transformation, such as changing a woman into a dog or bear, making a man appear a wolf or ass, or causing a human head or limb to resemble that of some animal. Even alchemy, or perhaps only the superstitious practice of it, Michael seems to classify as a forbidden magic art, saying, "Alchemy as it were transcends the heavens in that it strives by the virtue of spirits to transmute common metals into gold and silver and from them to make a water of much diversity," that is, an elixir. Lot-casting, on the other hand, both the authority of Augustine and many passages in the Bible pronounce licit.

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[1] fols. 2 and 20v.
[2] fols. 21v-22r.
[3] fol. 22r.
[4] fol 22v.
[5] In another passage at fol. 23r which speaks of a *magus* as inspecting entrails of animals I take it that the word is a slip of the copyist for *haruspex*.

Experiments of magic.

Michael more than once ascribes an experimental character to magic arts. Besides calling hydromancy "a short art of experimenting," he states that, since demons are naturally fond of blood and especially human blood, nigromancers or magicians, when they wish to perform experiments, often mix water with real blood or use wine which has been exorcized in order to make it appear bloody. "And they make some sacrifice with the flesh of a living human being, for instance, a bit of their own flesh, or of a corpse, and not the flesh of brutes, knowing that consecration of a spirit in a bottle or ring cannot be achieved except by the performance of many sacrifices."[1] Despite his censure of the art in the preface under discussion, we find a necromantic experiment of an elaborate character ascribed to Michael Scot in a fifteenth century manuscript[2] which purports to copy it "from a very ancient book,"[3] a phrase which scarcely increases our confidence in the genuineness of the ascription. The object of the experiment is to secure the services of a demon to instruct one in learning. Times and astrological conditions are to be observed as well as various other preliminaries and ceremonies; a white dove is to be beheaded, its blood collected in a glass vessel, a magic circle drawn with its bleeding heart; and various prayers to God, invocations of spirits, and verses of the Bible are to be repeated. At one juncture, however, one is warned *not* to make the sign of the cross or one will be in great peril.

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[1] fol. 175r.

History of astronomy.

But to return to Michael's *magnum opus*. The preface closes with a rather long and very confused[4] account of the history of astronomy and astrology. While Zoroaster of the lineage of Shem was the inventor of magic, the arts of divination began with Cham, the son of Noah, who was both of most subtle genius and trained in the schools of the demons. He tested by experience what they taught him and having proved what was true, indited the same on two columns and taught it to his son Canaan who soon outstripped his father therein and wrote thirty volumes on the arts of divination and instructed his son Nemroth in the same. When Canaan was slain in war and his books were burned, Nemroth revived the art of astronomy from memory and was, like his father, deemed a god by many because of his great lore. He composed a work on the subject for his son Ionicon,[1] whose son Abraham also became an adept in the art and came from Africa to Jerusalem and taught Demetrius and Alexander of Alexandria, who in turn instructed Ptolemy, king of Egypt, who invented astronomical canons and tables and the astrolabe and quadrant. The giant Atlas brought the art to Spain before Moses received the two tables containing the ten commandments. If this chronology surprises us, there is something more amazing to follow. At this point in the manuscript the copyist has either omitted a great deal[2] or Atlas was extremely long-lived, since we next read about his showing the astrolabe to two "clerks of France." Gilbertus (presumably Gerbert) borrowed the instrument for a while, conjured up demons—for he was the best nigromancer in France, made them explain its construction, uses, and operation to him, and furthermore all the rest of astronomy. Later he reformed and had no more dealing with demons and became bishop of Ravenna and Pope. Having thus got rather ahead of time, Michael mentions various other learned astronomers, most of whom really lived before Gerbert, such as Thebit ben Corat, Messahalla, Dorotheus, Hermes, Boethius, Averroes, John of Spain, Isidore, Zahel, and Alcabitius.

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[1] fol. 22v.

[2] Printed by Brown (1897), pp. 231-4.

[3] *Ibid.*, p. 18.

[4] At least in the MS which I have used; Bodleian 266, fols. 24r-25r.

The spirits in the sky, air, and earth.

Having finally terminated his preface, Michael begins the first book with a description of the heavens and their motion. Some say that the planets are moved by angels; others, by winds; but he holds that they are ruled by divine virtues, spiritual and not corporeal, but of whom little further can be predicated, since they are imperfectly known to man and naturally will remain so.[1] Later he states that they do not move or rule the celestial bodies naturally but as a service of obedience to their Creator.[2] He has already spoken in the preface of spirits in the northern and southern air, and asserted that very wise spirits who give responses when conjured dwell in certain images or constellations among the signs of the zodiac.[3] In the *Liber particularis* he speaks of similar demons in the moon.[4] Now he mentions "a legion of spirits damned" in the winds.[5] In later passages in the *Liber introductorius* he gives the names of the ruling spirits of the planets, Kathariel for Saturn,[6] and so on, and a list of the names of spirits of great virtue who, if invoked by name, will respond readily and perform in marvelous wise all that may be demanded of them.[7] And as the planets are said to have seven rectors who are believed to be the wisest spirits in the sky, so the seven metals are said to have seven rectors who are believed to be angels in the earth.[8] Names of angels also occur in some of his astrological diagrams.[9] This education of the reader in details of astrological necromancy shows that Michael is not to be depended upon to observe consistently the condemnation of magic and distinction between astrology and necromancy with which he started out in the preface.

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[1] What purported to be this work is listed in the *Speculum astronomiae* of Albertus Magnus, and Haskins, "Nimrod the Astronomer," *Romanic Review*, V. (1914), 203-12, has called attention to the following MSS: S. Marco VIII, 22; Vatic. Pal. Lat. 1417; and an extract in Ashmole 191. Haskins notes various mentions of Nimrod as an astronomer in medieval authors, but not the above passage from Michael Scot. Although Latin writers make Ioathon or Ionaton (and various other spellings) the disciple of Nimrod, in Syrian writers Ionitus is the fourth son of Noah and himself the discoverer of astronomy and teacher of Nimrod (Haskins, *op. cit.* 210-11).

[2] The word *Explicit* is written across the knees of a figure of the giant Athalax or Caclon who supports the heavens on his head at fol. 25r, col. 1, but the passage concerning "Gilbertus" follows and the proper Explicit of the preface does not occur until fol. 25v, col. 1. See Haskins, *op. cit.* p. 207 for pictures in the MSS of Atlas and Nimrod side by side, the one standing on the Pyrenees and supporting the starry firmament; the other on the mount of the Amorites bearing the starless heavens.

Occult medicine.

By affirming that the physician must know the state of the moon and of the wind and that "there are many passions of the soul under the sphere of the moon," [10] Michael introduces us to the subject of astrological medicine, a theme to which he returns more than once in the course of the work.[1] The practice of flebotomy is illustrated by a figure showing the influence of the signs of the zodiac upon the human body.[2] From the fact that there are fourteen joints in the fingers of the hand or toes of the foot Michael infers that man's span of life should be 140 years, a maximum which sin has reduced to 120.[3] There are as many medicines as there are diseases and these consist in the virtues of words, herbs, and stones, as illustrations of which Michael adduces the sacrament of the altar, the magnet and iron used by deep-sea sailors, and plasters and powders[4] In some cases, however, neither medicine nor astrology seems to avail, and, despite his preliminary condemnation of the magic arts, Michael argues that when the doctor can do nothing for the patient he should advise him to consult an enchantress or diviner.[5]

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[1] fol. 28r-v; also Canon. Misc. 555, fol. 22r.

[2] fol. 68v.

[3] fol. 21v.

[4] Canon. Misc. 555, fol. 17v.

[5] fol. 29v.

[6] fols. 150v-158r.

[7] fol. 172.

[8] fol. 145v.

[9] fol. 128v.

[10] fols. 30r, 31r.

The seven regions of the air.

From the seven planets and sphere of the moon Michael turns to the seven regions of the air, which are respectively the regions of dew, snow, hail, rain, honey, laudanum, and manna.[6] This is the earliest occurrence of this discussion which I have met, and I do not know from what source, if any, Michael took it. It is essentially repeated by Thomas of Cantimpré in his *De natura rerum*, where he gives no credit to Michael Scot but cites Aristotle's *Meteorology* in which, however, only dew, snow, rain, and hail are discussed. In the *History of Animals*[7] Aristotle further states that honey is distilled from the air by the action of the stars and that the bees make only the wax. Michael similarly describes the honey as falling from the air into flowers and herbs and being collected by the bees; but he distinguishes two kinds of honey, the natural variety just described and the artificial honey which results from the bee's process of digestion. He also explains that sugar (and molasses?) is not a liquor which will evaporate like honey and manna, but is made from the pith of canes.[1] "Laudanum" is a humor of the air in the Orient, and manna descends mainly in India with the dew, being found in Europe only in times of great heat. It is of great virtue, both medicinal and in satisfying hunger, as in the case of the children of Israel under Moses.

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[1] fol. 174r.

[2] fol. 144v.

[3] fol. 173v.

[4] fol. 173r, "Nam tot sunt medicine quot sunt infirmitates et hae constant in tribus videlicet in verbis, herbis, et lapidibus, virtutes quorum quotidie videmus ut in hostia sacrata super altare, in magnete et ferro navigantes in alto mari, et in emplastris, pulveribus, et consertis."

[5] fol. 175v.

[6] fols. 32v-35r.

[7] *Hist. Animal.* V, xix, 4.

Michael's miscellaneous content.

We cannot take the time to follow Michael in all his long ramblings through things in heaven above and earth beneath: sun, tides, springs, seasons, the difference between *stella, aster, sidus, signum, imago,* and *planeta,* the music of the spheres, the octave in music, eight parts of speech in grammar, and eight beatitudes in theology, zones and paradise, galaxy and horizon and zenith, divisions of time, the four inferior elements and the creatures contained in them, eclipses of sun and moon, Adam protoplasm and *minor mundus* as the letters of his name indicate, the mutable and transitory nature of this world, the inferno in the earth, and purgatory.

Further astrological doctrine.

Sooner or later Michael comes to or returns to astrological doctrine and technique, lists the qualities of the seven planets and head and tail of the dragon,[2] explains the names and some of the effects of the signs of the zodiac,[3] gives weather prognostications from sun and moon,[4] states the moon's influence in such matters as felling trees and slaughtering pigs,[5] and expounds by text and figures planetary aspects, exaltations, and conjunctions,[6] friendships and enmities.[7] The planet Mercury signifies in regard to the rational soul, grammar, arithmetic, and every science.[8] The election of hours is considered and a list given of what to do and not to do in the hour of each planet and that of the moon in each sign.[1] There then follows, despite Michael's animadversions in the preface against interpreters of dreams and those observing days, an "Exposition of dreams for each day of the moon," [2] nativities for each day of the week, and a method of divination from the day of the week on which the New Year falls.[3] A discussion of the effect of the moon upon conception is interrupted by a digression on eggs: how to estimate the laying power of a hen by the color and size of its crest, the effect of thunder upon eggs, how from eggs to make a water of great value in alchemy, and how to purify bad wine with the white of an egg.[4] Returning again to the moon, we are told that in the new moon intellects are livelier, scholars study and professors teach better, and all artisans work harder. Michael Scot used to say to the emperor Frederick that if he wished clear counsel from a wise man, he should consult him in a waxing moon and in a human and fiery or aerial sign of the zodiac.[5] Michael had spoken earlier of the planets as judges of the varied questions of litigators,[6] and now, although admitting the freedom of the human will, he proceeds to discuss at considerable length [7] the art of interrogations by which the astrologer answers questions put to him. With this the Bodleian manuscript of the *Liber introductorius* ends, apparently incomplete.[8]

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[1] fol. 35r, "de zuccaro et zaccara. Saccarum et zathara non sunt liquores vaporabiles ut mel et manna sed sit de medula cannarum."

[2] fols. 44r et seq.; fols. 150-8.

[3] fol. 75r et seq.; fols. 108-114.

[4] fols. 117-8.

[5] fol. 89.

[6] fol. 124 et seq.; fols. 132-5.

[7] fols. 145v-147v.

[8] fol. 45r.

Omission of nativities.

In the marginal gloss accompanying a Latin translation of the astrological works of Abraham Avenezra in a manuscript of the fifteenth century [9] Michael Scot is quoted a good deal on the subject of nativities. But the *Liber introductorius,* or at least as much of it as appears in the Bodleian manuscript, contains little upon this side of astrology, except the brief nativities for each day of the week. A passage quoted by Brown[1] to the effect that the person born under a certain sign will be an adept in experiments and incantations, in coercing spirits and working marvels, and will be an alchemist and nigromancer, appears in the manuscript as a marginal addition rather than part of the text and so is presumably not by Michael Scot himself.

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[1] fols. 162v-163.

[2] fol. 164v.

[3] fol. 165.

[4] fol. 176r-v.

[5] fol. 177v.

[6] fol. 28r.

[7] fols. 178-218.

[8] As Madan's description of the MS says, "The first book contains four *distinctiones*, of which the second ends on fol. 178, but it is difficult to state whether the MS contains anything beyond the first portion of the third *distinctio* of this first book, owing to the absence of decisive rubrics."

F. Boll (1903) states that the fourth *distinctio* is also missing in CLM 10268.

[9] BN 7438, 15th century.

Magic for every hour.

In connection with the subject of elections Michael gives a list of the prayers, conjurations, and images appropriate for each of the twelve hours of the day and of the night.[2] For instance, in the first hour of the day men pray to God and it is a good time to bind all tongues by images, characters, and conjurations. In the second hour angels pray to God and images and other devices to promote love and concord should be constructed then. In the third hour birds and fishes pray to God and it is a good time to make images and other contrivances to catch birds and fish. In the first hour of the night demons hold colloquy with their lord and the time is favorable for the invocation of spirits.

Quaint religious science.

A more Christian and less magical enumeration of the hours occurs in the *Liber particularis*.[3] At morning Christ was arrested on the Mount of Olives. In the first hour Christ was presented to Ananias and Caiphas, the high priests; in the third hour, to Pontius Pilate; in the sixth hour He was brought back to Herod and taken to Mount Calvary; in the ninth He was given vinegar and gave up the ghost and the earth quaked and the veil of the temple was rent in twain; at vespers He was taken down from the cross. Another specimen of this quaint religious science is found in the *Liber introductorius*,[4] where Michael, writing before the invention of the telescope, speaks of the limits set to seeing into the heavens except by special grace of God, as in the case of Katherine and of Stephen, the first martyr, who, when stoned, saw the heavens opened. A third example occurs in the third part of the *opus magnum*, or *Phisionomia*, where it is stated that at birth a male child cries "Oa" and a female child "Oe," as if to say respectively, "O Adam (or, O Eve) why have you sinned that I on your account must suffer infinite misery?"[1] In the same work Michael gives original sin as one of two reasons why a baby cannot talk and walk as soon as it is born.[2]

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[1] In a footnote at page 185, from Bodl. 266, fol. 113.

[2] fol. 162r.

[3] Canon. Misc. 555, fol. 4.

[4] Bodleian 266, fol. 47r.

The *Phisionomia.*

The third part of Scot's main work, and the only section which has been printed, is that primarily devoted to the pseudo-science of physiognomy, which endeavors to determine a man's character from signs furnished by the various parts of his body. The *Phisionomia*[3] is addressed to the Emperor Frederick II who is exhorted to the pursuit of learning in general and the science of physiognomy in particular. This is probably a conscious or unconscious imitation of the remarks addressed to Alexander by the Pseudo-Aristotle in *The Secret of Secrets,* of which also a considerable portion is devoted to physiognomy, and from which Rasis and Michael borrowed a good deal.[4] Indeed, the *Phisionomia* of Michael Scot is also often entitled *De secretis naturae* and really only a certain portion of it is devoted exclusively to physiognomy proper. Its early chapters and first part deal rather with the process of generation and it is only with the twenty-third chapter and second part that Michael "reverts to the doctrine of physiognomy." Perhaps these chapters on generation had more to do with the popularity and frequent printing of the work than did those on physiognomy.

Influence of the stars on human generation.

In this discussion of the process of human generation the influence of the stars receives ample recognition. Michael regards the moment of conception as of great astrological importance; then according to the course of the stars and the disposition of the bodies conceiving the foetus receives "similarly and simultaneously" each and all of the determining factors in its subsequent nature and history.[1] This we may perhaps regard as a medieval approach to the theory of Mendel. Michael further urges every woman to note the exact moment of sexual intercourse, when this is to result in generation, and so make astrological judgment easy.[2] Yet he states later that God gives a new and free soul with the new body, just as a father might give his son a new tablet on which to write whatever he wills of good or evil.[3] He notes the correspondence of the menstrual fluid to the waxing and waning of the moon and that planet's influence during the seventh month of the formation of the child in the womb,[4] and gives the usual account of the babe's chances of life or death according as it is born within seven months, or during the eighth, or ninth, or tenth month. It is not quite clear if it is because there are seven planets that Michael affirms that a woman can bear as many as seven children at once.[5] He adds that in this case the child conceived in the middle one of the seven cells of the matrix will be a hermaphrodite.[6]

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[1] *Phisionomia* (1740) cap. xi, p. 235.

[2] *Ibid.*, cap. ix, p. 229.

[3] Or *Phisonomia* as it is often spelled in the medieval texts themselves.

[4] Brown (1897), 32 and 37.

Discussion of divination.

Scot's treatise on Physiognomy has considerable to say of other forms of divination and they here appear in a more favorable light than in his discussion of varieties of the magic arts in the preface preceding his *Liber introductorius*. Among signs to tell whether a pregnant woman will give birth to a boy or a girl he suggests "a chiromantic experiment"[7] which consists simply in asking her to hold out her hand. If she extends the right, the child will be a boy; if the left, a girl. He also expounds methods of augury at some length, although again stating that they are in the canons of the church, that is to say prohibited by canon law. The divisions of space employed in augury are twelve in number after the fashion of the signs of the zodiac.[1] Michael also discusses the significance of sneezes. If anyone sneezes twice or four times while engaged in some business and immediately rises and moves about, he will prosper in his undertaking. If one sneezes twice in the course of the night for three successive nights, it is a sign of death or some catastrophe in the house. If after making a contract one sneezes once, it is a sign that the agreement will be kept inviolate; but if one sneezes thrice, the pact will not be observed.[2]

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[1] Edition of 1740, p. 210, "Et secundum cursum corporum superiorum sicut dispositionem corporum concipientium foetus recipit similiter et semel omnia et singula quae postea discernunt ordinem temporum et naturae."

[2] Cap. 7 (1740), p. 226.

[3] Cap. 8 (1740), p. 228.

[4] Cap. 3 (1740), p. 218; cap. 10, p. 230.

[5] Cap. 2 (1740), p. 213.

[6] Cap. 7 (1740), p. 227.

[7] Cap. 18 (1740), p. 248, "In chiromantia est illud experimentum. . . ."

Divination from dreams.

Dreams and their interpretation are also discussed in the *Physionomia*.[3] The age of the dreamer, the phase of the moon, and the stage reached in the process of digestion, all have their bearing upon interpretation. A dream which occurs before the process of digestion has started either has no significance or concerns the past. The dream which comes while the food is being digested has to do with the present. Only when the process of digestion has been completed do dreams occur which signify concerning the future. In order to recall a dream in the morning Michael recommends sleeping upon one's other side for the remainder of the night or rubbing the back of the head the next day. Some dreams signify gain, others loss; some joy, others sadness; some sickness, others health, others war; some labor, others rest. For instance, to catch a bird signifies gain, to lose a bird in one's dream signifies loss; to mourn in dreams portends joy, to laugh indicates grief. The rest of his discussion of dreams Scot limits to their significance in matters of health and physical constitution. He takes up dreams indicative of predominance of blood, red cholera, phlegm, and melancholy respectively; of heat, cold, dryness, and humidity; of excess of humors and of bad humors.

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[1] *De notitia auguriorum*, cap. 57 (1740), p. 285.

[2] Cap. 58 (1740), pp. 288, 289, 290.

[3] Caps. 46-56 (1740), p. 280, *et seq.*

Works of divination ascribed to Michael Scot.

While on the subject of divination we may note that a geomancy[1] and a chiromancy[2] have been ascribed to Michael Scot, and also prophetic verses concerning the fate of Italian cities in the style of the Sibylline verses and prophecies of Merlin. Brown held that the evidence for the authenticity of these verses was as convincing as that for any event in Scot's life.[3]

Medical writings.

It would not be surprising to find that Michael himself practiced medicine as well as astrology, in view of the attention given to human physiology and the process of generation in his *Physiognomy* and elsewhere, and the interest in biology which his translation of the Aristotelian works on animals evidences. A treatise on prognostication from the urine is ascribed to him[4] and "Pills of Master Michael Scot" are mentioned in at least one manuscript,[5] where they are declared to be good for all diseases and of virtue indescribable.

Occult virtues.

Michael's general allusion to the occult virtue of words, herbs, and stones in the *Liber introductorius* may be supplemented by a few specific examples of the same from the other two divisions of his main work. In the *Liber particularis* he mentions such virtues of stones as the property of the agate to reveal various signs of demons and illusions of enchantment, and the power of the jasper to render its bearer rich, amiable, and eloquent.[6] In the *Phisionomia* he suggests that persons who cannot maintain physical health without frequent sexual intercourse may be able to do so by carrying a jasper or topaz.[7] He also states that bathing in the blood of a dog or of two-year-old infants mixed with hot water "undoubtedly cures leprosy,"[1] and that many sorceries can be wrought by use of the menstrual fluid, *semen,* hairs of the head, blood, and footprints in dust or mud.[2]

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[1] CLM 489, 16th century.

[2] *Chiromantica Scientia, quarto minori sine notis typographicis, foliis 28 constat impressis. "Ex divina philosophorum academia secundum nature vires ad extra chyromantitio diligentissime collectum. Exordium." Cl. Denis, qui alias editiones huius operis adfert, Michaelum Scotum auctorem eiusdem censeri tradit.*

[3] Brown (1897), 163 *et seq.*

[4] Vatican, Regina di Svezia, 1159, fol. 149, "Finis urinarum Magistri Michaelis Scoti." To the two MSS listed by Brown, p. 153, note 6, containing an Italian translation, may be added Perugia 316, 15th century, fols. 91-106, "Qui chomenza el tractato delle orine secondo come mete maistro Michelle sthato strollogo del re Ferigo ai nostri bexogni."

[5] Addit. 24068, 13th century, fol. 97v.

[6] Canon. Misc. 555, fol. 50r-v.

[7] (1740), p. 222.

Astrology in the *Commentary on the Sphere.*

Michael Scot's *Commentary upon the Sphere of Sacrobosco*[3] confines itself rather more strictly to astronomical and astrological topics than did the *Liber introductorius,* but otherwise their contents are not dissimilar. In the Commentary Michael discusses such questions as whether the universe is eternal, one or many, and what form or figure it should have; whether the mover of the sky is moved, whether the stars are spherical bodies, and whether the zone between the tropic of Capricorn and the Antarctic Circle is temperate and inhabited. Also whether the elements are four in number, and whether the heavens include a ninth sphere. One argument against its existence is that there are no stars in it, on which account some hold that it would exert no influence upon the earth. But Michael replies that it has light apart from any starry bodies and by virtue of this light does exert influence. Other astrological questions which he raises are whether the signs of the zodiac should be designated by the names of animals, whether the first heaven is a more potent cause of generation and corruption than the circle of the zodiac is, whether celestial bodies have particular properties as terrestrial bodies do, whether the heavens are animate, whether their motion is natural or voluntary, whether the motion of the planets is rational, and whether super-celestial bodies act upon inferiors by virtue of their motion. In mentioning the departments of life over which the seven planets rule, Michael cites either theologians or astrologers [1] to the effect that Saturn signifies concerning pagans, Jews, and all other adversaries of the Faith, who are slow to believe just as Saturn is slow of movement and chilling in effect, while Jupiter is the sign of true believers and Christians.

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[1] *Phisionomia,* cap. 14 (1740), p. 241.

[2] *Ibid.,* cap. 10, p. 233.

[3] If the ascription of this *Commentary* to Michael is correct, probably either he wrote it toward the end of his life or Sacrobosco composed the *Sphere* fairly early in his career, since he appears to have outlived Michael and to have composed his *Computus ecclesiasticus* or *De anni ratione* in 1244: see Duhem III (1915), p. 240. The lines quoted in DNB "John Holywood or Halifax" as on his tomb in the cloister of the Mathurins and as having reference to the date of his death are really the verses at the close of his *Computus ecclesiasticus:*

"M Christi bis C quarto deno quater anno
De Sacro Bosco discrevit tempora ramus
Gratia cui dederat nomen divina Johannes," etc.

Cantor II (1913), p. 87, however, speaks of two different tomb inscriptions given by Vossius and Kästner but says that they agree on 1256 as the date of Sacrobosco's death. The first line above quoted is sometimes interpreted as giving the date 1256 rather than 1244.

Dionysius the Areopagite and the solar eclipse during Christ's passion.

In commenting upon Sacrobosco's concluding passage concerning the miraculous eclipse at the time of Christ's passion and the remark attributed to Dionysius the Areopagite, "Either the God of nature suffers or the machine of the universe is dissolved," Michael explains that ancient Athens was divided into three parts. One of these was the shore which was consecrated to Neptune, but in place of the plain and the mountains, Michael appears to take a leaf out of Plato's *Republic* and mentions the region of the warriors, dedicated to Pallas, goddess of war, and the residential quarter of the philosophers, named the Areopagus from Ares meaning virtue and *pagus* meaning villa. According to Michael the altar to the unknown god was erected by Dionysius the Areopagite at the time of the darkness and earthquake accompanying Christ's passion, and when Paul came and preached the Christ whom he ignorantly worshiped, Dionysius was converted, and became a missionary to the Gauls, bishop of Paris, and finally gained a martyr's crown.

Alchemy.

In the *Liber Introductorius* Michael seemed to associate alchemy with the magic arts. In his *Commentary on the Sphere* his attitude is more favorable. After citing the fourth book of the *Meteorology* and other passages from Aristotle to the effect that no element can be corrupted and hence the transmutation striven after by the alchemists is impossible, Michael explains that the word element may be taken in two senses. As a part of the universe it is neither generable nor corruptible, but in so far as an element is mixed with active and passive qualities, it is both generable and corruptible.[1]

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[1] In the *editio princeps* of 1495 the marginal heading is, *"Quid de planetis sentiunt theologi,"* but in the text we read *"thrologi,"* which is possibly derived from *"asthrologi"* by a dropping off of the first syllable.

Works of alchemy ascribed to Michael Scot.

Thanks perhaps to this passage the composition or translation of several works of alchemy is ascribed to Michael Scot in manuscripts or printed editions. The *Quaestio curiosa de natura Solis et Lunae,* which was printed as Michael's in two editions of the *Theatrum Chemicum,*[2] was apparently written after his death.[3] A Palermo manuscript contains among other alchemical tracts a "Book of Master Michael Scot in which is contained the mastery." [4] In at least one manuscript Michael Scot is called the translator of the *Liber luminis luminum,* of which Rasis is elsewhere mentioned as the original author.[5] In an Oxford manuscript a *De alchemia* is attributed to Michael Scot. It is addressed to "you, great Theophilus, king of the Saracens" [6] rather than to the Emperor Frederick, and speaks of "the noble science" of alchemy as "almost entirely rejected among the Latins." Michael Scot mentions himself by name in it rather too often for us to accept the treatise as his without question, while the allusions to "Brother Elias" the Franciscan as a fellow-worker in alchemy are perhaps also open to suspicion.

Brother Elias and alchemy.

We find, however, another suggestion of Brother Elias's interest in alchemy and association therein with Michael

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[1] Edition of 1495, fol. b-ii, verso.

[2] Strasburg, 1622 and 1659.

[3] And is not a chapter from the *Liber Introductorius;* see Brown, 77-8.

[4] *Liber Magistri Michaelis Scotti in quo continetur Magisterium,* No. 44 in a MS belonging to the Speciale family. I have not seen the MS. It is described briefly by Brown, 78-80; see further S. A. Carini, *Sulle Scienze Occulte nel Medio Evo,* Palermo, 1872.

[5] See bibliographical note at the beginning of this chapter.

[6] This expression occurs in the course of the text itself—Corpus Christi 125, fol. 97r—in addition to the words scratched in the upper margin at the beginning by another hand, *"Michael Scotus Theophilo Regi Saracenorum."* The conclusion of the treatise is in a 14th century hand, the remainder in a 15th century hand.

Scot in the fact that in the same manuscript containing the translation of the *Liber luminis luminum* ascribed to Michael occurs another *Liber lumen luminum* which Brother Elias, General of the Friars Minor, edited in Latin for the Emperor Frederick.[1] A brother Cyprian translated it from Arabic into Latin for him. In view of the later interest of another Franciscan friar, Roger Bacon, in alchemy and the supposition which some have entertained that he was persecuted by his Order because of his experimental studies, this reputation of Brother Elias as an alchemist is interesting to note. One of St. Francis's earliest followers, he succeeded him in 1226 as General of the Order. Deposed by the pope in 1230 on the charge of promoting schism in the Order, he was re-elected in 1236 and was again deposed by the pope in 1239, after which he joined the imperial party and was excommunicated from 1244 until just before his death in 1253.[2] Brown suggested that his alchemical activities were alluded to by the pope on the occasion of his first deposition in the words *mutari color optimus auri ex quo caput erat compactum*."[3] But if Elias was an alchemist, no open objection to this appears to have been made either by the pope or his Order. Indeed, many of the alchemists in Italy of the twelfth and thirteenth centuries were clergy and even friars.[4]

Liber luminis luminum and *De alchemia.*

Brown has already discussed the contents of the *Liber luminis luminum* and *De alchemia* (or, *alchimia*)[5] but erroneously and from not quite the same standpoint as ours. He incorrectly interprets "the secrets of nature" which the writer says he has investigated as the title of a book which has formed his chief source.[6] Brown also states that one of several features which distinguishes the *De alchemia* from the *Liber luminis* "is an early passage which refers to the correspondence between the metals and the planets." [1] But there is a similar passage connecting seven metals with the seven planets in the opening paragraph of his own printed text of the *Liber luminis luminum.*[2] The latter treatise, brief as it is, divides into five parts dealing with salts, alums, vitriols, spirits, and the preparation of alums, and the employment of these in transmutation. The *De alchemia* is less orderly in arrangement and seems largely a brief collection of particular recipes for transmutation.

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[1] See bibliographical note at opening of this chapter.

[2] Brown, p. 91, citing Wadding, I, 109.

[3] Brown, p. 91, note 2.

[4] Berthelot (1893) II, 74 and 77; Lippmann (1919) 481. I doubt if there is much ground for their further assertion that such clerics fell easily under suspicion of heresy and hence wrote in ciphers like Roger Bacon's for gunpowder. At p. 688 I have refuted the notion that Bacon employed a cipher to conceal the recipe for gunpowder.

[5] In his fourth chapter, "The Alchemical Studies of Michael Scot."

[6] If the title of any book were meant, it would rather be Michael's own *De secretis naturae,*

Their further characteristics.

Both works emphasize the secret character of alchemy. The *De alchemia* holds forth concerning the great secret of Hermes and Ptolemy, and tells how most men's eyes are blinded, and to how few the truth of the art is revealed. The *Liber luminis luminum* narrates that "when the great philosopher was dying he said to his son, 'O my son, hold thy secret in thy heart, nor tell it to anyone, nor to thy son, unless when thou canst retain it no longer.' Wise philosophers have yearned with yearning to know the truth of this salt. But few have known it and those who have known it have not told in their books the truth concerning it as they saw it." [3] Both works also are largely experimental in form and in the *De alchemia* we are assured more than once that "I, Michael Scot, have experienced this many times." [4] The books of the ancients and past philosophers are cited both in general and by name, but a black vitriol from France called French earth [5] and a gum found in

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since he not only says, "Cum rimarer et inquirerem secreta naturae ex libris antiquorum philosophorum . . . ," but also, "Quedam extraxi et ea secretis nature adiunxi. . ."

[1] P. 92.

[2] P. 240, "Et notum est quod sicut 7 sunt metalla ita 7 sunt planete et quodlibet metallum habet suum planetam," etc.

[3] For Latin text see Brown, p. 248. The same passage occurs in another alchemical treatise, *Liber Dedali philosophi,* which Brown printed on opposite pages to the text of the *Liber luminis luminum.*

[4] Corpus Christi 125, fol. 99v, "et ego multotiens sum expertus," fol. 100r, "Et ego michael scotus multotiens sum expertus," etc.

[5] Brown, p. 262, "Vitriolum nigrum apportatur de Francia et idcirco dicitur terra francigena. Cum isto mulieres vulvam con-

Calabria and at Montpellier[1] are mentioned as well as herbs and minerals from India and Alexandria, and we also hear of the experiments of brother Elias, certain Saracens who seem of comparatively recent date, and of the operation at Catania or Cortona by master Jacob the Jew which "I afterwards proved many times."[2] The *Liber luminis luminum* often speaks of "the great virtue" of this or that, and both treatises make much use of animal substances such as "dust of moles," the urine of the *taxo* or of a boy, the blood of a ruddy man or of an owl or frog. Five toads are shut up in a vessel and made to drink the juices of various herbs with vinegar as the first step in the preparation of a marvelous powder for purposes of transmutation.[3]

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stringunt ut virgines appareant. Non est autem magne utilitatis in ista arte."

[1] Corpus Christi 125, fol. 99r.

[2] *Ibid.*, fol. 100r, "Et ego vidi istam operationem scilicet apud cartanam a magistro jacobo iudeo et ego postea multotiens probavi. . . ."

[3] Brown, p. 252, for Latin text.

CHAPTER LII

WILLIAM OF AUVERGNE

The man and his writings—His respect for science—And for experimentation—Influenced by Christian doctrine—Importance of his account of magic—Its main points summarized—Demons and magic—Magic and idolatry—Magic illusions—Natural magic—Is not concerned with demons—Some instances of natural magic—"The sense of nature"—Magic's too extreme pretensions—Wax images—Factitious gods—Characters and figures—Power of words denied—Use of divine names—Christian magic—Magic of sex and generation—William's contribution to the bibliography of magic—Plan of the rest of this chapter—Theory of spiritual substances—Spirits in the heavens—Will hell be big enough?—Astrological necromancy—False accounts of fallen angels—Different kinds of spirits—Limited demon control of nature—Can demons be imprisoned or enter bodies?—Susceptibility of demons to the four elements and to natural objects—Stock examples of natural marvels—The hazel rod story—Occult virtues of herbs and animals—Virtues of gems—A medley of marvelous virtues—Divination not an art but revelation—Divination by inspection of lucid surfaces—Other instances of divination, ancient and modern—His treatment of astrology—The philosophers on the nature of the heavens and stars—William's own opinion and attitude—Objection to stars as cause of evil—Virtues of the stars—Extent of their influence upon nature and man—Against nativities, interrogations, and images—Astrology and religion and history—Comets and the star of Bethlehem.

The man and his writings.

We now come upon a Christian theologian whose works present an unexpectedly detailed picture of the magic and superstition of the time.[1] He is well acquainted with both

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[1] *Gulielmi Alverni episcopi Parisiensis mathematici perfectissimi eximii philosophi ac theologi praestantissimi Opera omnia per Joannem Dominicum Traianum Neapolitanum Venetiis ex officina Damiani Zenari,* 1591. The *De universo* occupies nearly half of the volume, pp. 561-1012. My references will be to this edition and to the *De universo* unless some other title is specified. In it—and in such other editions of William's works as I have seen—the chapter headings are often very poor guides to the contents, especially if the chapter is of any length. There are at Paris thirteenth century MSS of the *De fide* and *De legibus* (BN 15755) and *De universo* (BN 15756).

The chief secondary work on William of Auvergne is Noel Valois, '*Guillaume d'Auvergne,* the occult literature and the natural philosophy of the day, and has much to say of magic, demons, occult virtue, divination and astrology. Finally, he also gives considerable information concerning what we may call the school of natural magic and of experiment. This theologian is William of Auvergne, bishop of Paris from 1228 to his death in 1249, and previously a canon of that city and a master of theology in its university. Judging from his age when he received this degree Valois estimates that he was born about 1180. He was made a bishop at Rome by the pope, where he had come as a simple deacon to pursue his appeal in the recent disputed election.[1] He granted the Dominicans their first chair of theology at Paris during a quarrel of the university in 1228 with Queen Blanche of Castile and the dispersion of the faculties to Angers and Rheims.[2] He took a prominent part in the Parisian attack upon the Talmud and was perhaps the first Christian doctor of the Latin west to display an intimate acquaintance with the works attributed to Hermes Trismegistus.[3] These facts suggest the extent of his reading in occult lore. We shall consider his views as expressed in his various writings, "On Sins and Vices," "Of Laws" (or Religions), in the frequent medieval use of the word, *lex,* "Of Morals," "Of Faith," but especially in his voluminous work on "The Universe" which deals more with the world of nature than do his other theological treat-

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Paris, 1880. One chapter is devoted to his attitude to the superstitions of his age, and goes to the other extreme from Daunou, HL XVIII, 375, whom Valois criticizes for calling William extremely credulous. The inadequacy of Valois' chapter, at least from our standpoint, may be inferred from his total omission of William's conception of "natural magic." Valois has no treatment of William's attitude to natural science but contents himself with a discussion of his philosophy and psychology. (See also M. Baumgartner, *Die Erkenntnislehre des Wilhelm von Auvergne,* Münster, 1893.) The chapter on William's attitude to superstition is largely given over to examples of popular superstitions in the thirteenth century, supplementing legends of Brittany and other stories told by William with similar anecdotes from the pages of Stephen of Bourbon, Caesar of Heisterbach, and Gervaise of Tilbury. Valois' citations of William's works are from an edition in which the pages were numbered differently from those in the one I used.

[1] Valois (1880), pp. 9-11.

[2] Valois (1880), p. 53.

[3] HL 18, 357.

ises. Indeed, in the sixteenth century edition of his works he is called "a most perfect mathematician" and "a distinguished philosopher" as well as "a most eminent theologian."

His respect for science.

William at any rate has respect for natural philosophy and favors scientific investigation of nature. Like his namesake of Conches in the preceding century he has no sympathy with those who, when they are ignorant of the causes of natural phenomena and have no idea how to investigate them, have recourse to the Creator's omnipotent virtue and call everything of this sort a miracle, or evade the necessity of any natural explanation by affirming that God's will is the sole cause of it. This seems to William an intolerable error, in the first place because they have thus only one answer for all questions, and secondly because they are satisfied with the most remote cause instead of the most immediate one. There is no excuse for thus neglecting so many varied and noble sciences.[1]

In another passage William apologizes to the person to whom the *De universo* is addressed for the summary and inadequate discussion of the stars in which he has just been indulging.[2] He knows that certitude in this subject calls for a most thorough investigation and requires a separate treatise. Moreover, his remarks have been in the nature of a digression and have little direct bearing on the question under discussion. But he has introduced them in order that his reader might see something of the depth and truth of philosophical discussion and not think that it can be despised as some fools do, who will accept nothing unless it is armed with proofs and adorned with flowers of rhetoric and who still more insanely regard as erroneous whatever they do not understand.

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[1] II-iii-20, (pp. 994-95). Yet in another connection (I-i-46, pp. 625-26) William inconsistently makes the assertion that everything depends absolutely upon God's will alone as an argument against employing magic images to gain one's ends. He tells a story of a man who, when a magician offered to secure him some great dignity in his city, asked him if he could get it against God's will. When the magician admitted that he could not, the man asked if he could prevent securing it if God willed it and the magician again answered "No." The man then said that he would commit it all to God. William does not seem to see that this attitude is the same as that of ignorant persons who leave scientific investigation to God or of hungry people who expect God to feed them.

[2] I-i-44, (p. 613).

And for experimentation.

Thus we see the scientific standards of William of Conches in the twelfth century still influential and probably more universally prevalent in the thirteenth. Like his namesake of Conches again, William of Auvergne states that our common fire is not the pure element, since it is largely made up of burning coal or wood or other consumed objects.[1] He also states that "innumerable experiences" have proven that moles do not live on earth but hunt worms in it.[2] William is aware that many sailors and navigators have found by experience that certain seas open into others, and as another indication that all seas are really only one connected sea, he adduces hidden subterranean channels, and mentions the report that Sicily is supported on four or five mountains as if by so many columns. Such are some illustrations of the bits of scientific information and the trust in natural experiment to be found in William's work. It is indeed surprising the number of times he alludes to "experimenters" and to "books of experiments."

Influenced by Christian doctrine.

On the other hand William, of course, maintains such doctrines as that of creation against the Peripatetic theory of the eternity of the universe. He also does not confuse the world soul with the Holy Spirit as William of Conches and Theodoric of Chartres had done.[3] More important than these particular points is the general hypothesis running through and underlying much of William's thought that the Creator can interfere again in the course of nature at any time and in any way He wills.[4] The atmosphere of the miraculous and the spiritual is almost constantly felt in William's account of the universe. To a certain extent, however, he evades the difficulties between science and religion by holding that one thing is true in philosophy and quite another in theology. Thus he affirms that one who says that the stars and lights of the sky do not receive addition or improvement, speaks the truth if the matter is regarded from the standpoint of natural science, for nature cannot add anything to their natural perfection. "Yet you ought to know that learned Christian doctors teach . . . and the prophets seem to say expressly that they will undergo improvement." [1] It is, then, as we said to begin with, the account of magic, demons, occult virtue, divination, astrology and experimental science, of a theologian not ignorant of nor unsympathetic with science that we have now to consider.

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[1] I-i-42, (p. 608).

[2] *Ibid.*, (p. 606).

[3] See I-iii-31, (p. 759). See also Valois, 304 and M. K. Werner, *Wilhelms von Auvergne Verhältniss z. d. Platonikern des XII Jhts*, in *Vienna Sitzb.*, vol. 74 (1873), p. 119 *et seq.*

[4] See I-ii-30, (p. 694) for an expression of this view.

Importance of his account of magic.

William's account of magic is a remarkable and illuminating one. Most of it occurs in the closing chapters of the *De universo*. William himself there states that nothing has come down from previous writers on the things of which he has just been speaking.[2] He admits that his remarks are incomplete but he has at least made a beginning which will prove welcome to the reader. Probably, however, he is indebted to previous Christian writers; at any rate we recognize some of his statements as familiar. But he also has a wide acquaintance with the literature of magic itself—in his youth he examined the books of judicial astronomy and the books of the magicians and sorcerers [3]—and he combines the results of his reading in a sane manner. We feel that his view is both comprehensive, including all the essential factors, and marked by insight into the heart of the situation. For his time at least he sees remarkably clearly what magic is, what it cannot do, and how it is related to the science of that age.

Its main points summarized.

The chief characteristics of magic as it is depicted by William may first be briefly summarized, and then illustrated in more detail. He constantly assumes that its great aim is to work marvels. He holds that often the ends are sought by the help of demons and methods which are idolatrous. Evil ends are often sought by magicians. On the other hand the apparent marvels are often worked by mere human sleight-of-hand or other tricks and deceptions of the magicians themselves. But the marvel may be neither human deceit nor the work of an evil spirit. It may be produced by the wonderful occult virtues resident in certain objects of nature. To marvels wrought in this manner William applies the name "natural magic," and has no doubt of its truth. But he denies the validity of many methods and devices in which magicians trust, and contends that marvels cannot be so worked unless demons are responsible. William furthermore constantly cites books of experiments and narrates the feats of "experimenters" in discussing magic, and he often implies a close connection of it with astronomy or astrology. Here again as in the case of natural magic we see an intimate connection between the development of magic and of natural science. Finally, these various characteristics and varieties of magic are not always kept distinct by William, but often overlap or join. The demons avail themselves of the forces of nature in working their marvels and their marvels too are often only passing illusions and empty shams. The experimenters and operators of natural magic also deal in momentary effects and deceptive appearances as well as in more solid results.

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[1] I-ii-31, (p. 695).
[2] II-iii-23, (pp. 1003-4).
[3] *De legibus*, Cap. 25, (p. 75).

Demons and magic.

William holds then that much of magic is performed by the aid of demons and involves the worship of them or other forms of idolatry.[1] One reason why magic feats are so seldom performed in Christian lands and William's own time is that the power of the evil spirits has been so repressed by Christianity. But the books of the magicians and of the sorcerers assume the existence of armies of spirits in the sky.[2] In the necromantic operation called "The Major Circle" four kings of demons from the four quarters of the earth appear with numerous attendants according to the

[1] I-ii-21, (p. 680): II-iii-7, (p. 973).

[2] II-iii-23, p. (1003): *De legibus,* Cap. 24, (p. 73): II-ii-29, (p. 820).

statements of those who are skilled in works of this sort.[1] William has also read in the books of experiments that water can be made to appear where there really is none by use of a bow of a particular kind of wood, an arrow of another kind of wood, and a bow-string made of a particular sort of cord.[2] As far as an arrow is shot from this bow so far one is supposed to behold an expanse of water. But William does not believe that the bow and arrow possess any such virtues, and hence concludes that the mirage is an illusion produced by the demons and that the ceremony performed by the magician is a service to the evil spirits. Another writer in his book of necromancy bids one to take as an oblation such and such a wood or stone or liquor on such a day at such an hour. Here too, perhaps because of what he regards as superstitious observance of times and seasons, William holds that the word "oblation" covers some diabolical servitude or cult, which has been concealed by the writers of such experiments. He also states that sorcerers and idolaters often go off into deserts to have dealings with the demons who dwell there.[3] He cites "a certain magician in his book on magic arts" who says that in order to philosophize he went to places destitute of any inhabitant and there lived for thirty years with those who dwelt in light and learned from them what he has written in his book.

Magic and idolatry.

In his treatise *De legibus* William, like Maimonides, endeavors to explain some of the questionable provisions and prohibitions in the Mosaic law as measures to guard against idolatry and magic.[4] Under the head of idolatry he groups not only the worship of idols proper and of demons, but also superstitious observance of the stars, the elements, images, figures, words and names, times and seasons, beginnings of actions and finding objects.[5] In another passage he adds the observance of dreams, auguries, constellations, sneezes, meetings, days and hours, figures, marks, characters and images.[1] Also incantation is not without idolatry. Thus many features of the magic arts are condemned by him.

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[1] II-iii-7, (p. 971).

[2] II-iii-22, (p. 998).

[3] *De legibus,* Cap. 9, (pp. 38-39).

[4] See Cap. 13 (p. 43) and before.

[5] Cap. 23, (p. 65).

Magic illusions.

We come next to those magic works which are "mockeries of men or of demons." [2] First there are those transpositions which are accomplished by agility and hability of the hands and are popularly called *tractationes* or *traiectationes*. They are a source of great wonderment until men learn how they are done. A second variety are mere apparitions which have no truth. Under this head fall certain magic candles. One made of wax and sulphurated snakeskin, burned in a dark place filled with sticks or rushes makes the house seem full of writhing serpents. William's explanation of this is that the powdered snakeskin as it burns makes the rushes appear similar in color to serpents, while the flickering of the flame gives the illusion that they are moving. Possibly, however, this may be a defective recipe for some firework like the modern "snake's nest." William is more sceptical whether in the light of a candle made of wax and the tears or *semen* of an ass men would look like donkeys. He doubts whether wet tears would mix with wax or burn if they did, and whether these internal fluids possess any of the substance, figure, and color of an ass's external appearance. He concedes nevertheless that the *semen* has great virtue and that the sight is of all senses the most easily deceived. At any rate "experimenters" (*experimentatores*) have said things of this sort, and you may read in the books of experiments a trick by which anyone's hand is made to appear an ass's foot, so that he blushes to draw it from his bosom.[3]

The work of necromancy called "The Major Circle" is also in the nature of a delusive appearance. The four demon kings from the four quarters of the earth seem to be accompanied by vast hosts of phantom horsemen, jugglers, and musicians, but no prints of horses' hoofs are visible afterwards. Moreover, if real horsemen appeared, they would be seen by everyone, not merely by those within the magic circle. Another common apparition, produced by "these sorcerers and deceivers" by means of sacrifices and other evil observances which William will not reveal, is a wonderful castle with gates, towers, walls, and citadel all complete. But it is seen only during the magic operation and when it vanishes leaves no trace behind. William compares such illusions to some fantastic dream which leaves behind nothing but horror on the faces of the participants. He argues that if corporeal things outside us make the strong impression on our senses that they do, it is no wonder if spiritual substances like demons who are full of forms can impress our minds potently. It will, of course, occur to the modern reader that such illusions, like the rope-climbing of India, were perhaps produced by hypnotic or other suggestion. William notes that illusions of this sort are shown only to the gullible and "those ignorant of natural science," and that necromancers dare not produce or suggest such phantasms in the presence of learned and rational men.

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[1] Cap. 14, (pp. 44-45).

[2] II-iii-22, (p. 998) . . . opera huiusmodi quae opera magica et ludificationes vel hominum vel daemonum nuncupantur.

[3] II-iii-7, (p. 971): II-iii-12, (pp. 977-79).

Natural magic.

There are, nevertheless, occult forces and powers in nature and those men who are acquainted with them work many marvels and would work much more wonderful ones, if they had an abundant supply of the necessary materials.[1] This is "that part of natural science which is called natural magic." [2] "Philosophers call it necromancy or *philosophica,* perhaps quite improperly, and it is the eleventh part of all natural science." This rather strange association of necromancy with natural science for which William seems to apologize, we shall meet again in Albertus Magnus and we have already met with it in Gundissalinus, Daniel of Morley, and Al-Farabi. With them, however, necromancy was one of only eight parts of natural science or astrology. In a third passage William omits mention of necromancy, but again asserts that certain marvels are natural operations and that knowledge of them is one of the eleven parts of natural science.[1] It is with it that the books of experiments are especially concerned.[2] From them and from "the books of natural narrations" you can learn "the causes and reasons of certain magic works, especially those which are by the art of natural magic." The materials possessed of the marvelous virtues essential for this art are very rare in Europe, but in India and lands near it they abound, and hence natural magic flourishes vigorously there, and there are many experimenters there who work marvels by their skill.[3]

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[1] II-iii-21, (pp. 997-998) naturarum vires et potentias occultas, etc.

[2] I-i-43, (p. 612): *De legibus,* Cap. 24, (p. 67).

Natural magic is not concerned with demons.

Between this natural magic and that due to demons William makes a decided distinction.[4] In natural magic nothing is done by the aid of demons. The workers of the one are called *magi* because they do great things (*magna agentes*) although some may have evilly interpreted the word as meaning evil-doers (*male agentes*).[5] And these others who perform such works by the aid of demons are to be regarded as evil-doers. William indeed perhaps uses the word *malefici* (sorcerers) more often than *magi* for workers of evil magic, but he cannot be said to observe any such distinction uniformly. He does, however, express his intention of setting forth "the causes and ways and methods" by which even the phantasies and illusions of magic are produced naturally, but of "perditious methods such as nefarious sacrifices and oblations and sacrilegious observances" he intends to reveal nothing.[6] In natural magic William seems to see no harm whatever, unless it is employed for evil ends. He grants, however, that some of its works are so marvelous that they seem to the ignorant to be the works of gods or demons, and that this has been one cause of idolatry in times past.[7] So in order that Christianity might prevail, it was ordered that anyone performing such works should be considered evil and a sorcerer (*malus et maleficus*), and that works of this sort should be regarded as performed not by the virtue of any natural object but rather by the aid and power of demons. But specialists in such matters are not "surprised at these feats but glorify the Creator alone in them, knowing that nature alone in accordance with His omnipotent will operates both in the customary manner known to men and contrary to custom not only in new ways but new things." In another context William again affirms that natural magic involves no offense or injury to the Creator unless one works evil or too curiously by that art.[1]

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[1] *De legibus*, Cap. 14 (p. 44).
[2] II-iii-22, (p. 999).
[3] II-iii-23, (p. 1003).
[4] *De legibus*, Cap. 14, (p. 46).
[5] II-iii-21, (p. 998).
[6] II-iii-12, (p. 979).
[7] *De legibus*. Cap. 24, (pp. 67-68).

Some instances of natural magic.

One example of the marvels worked by means of natural magic is the sudden generation of such animals as frogs and worms. Here the natural processes of generation are hastened by applying certain aids, and William does not doubt the assertion of Emuth that by mixing seeds new animals can be bred.[2] Other phenomena belonging under natural magic are the marvels worked outside its own body by the soul of the basilisk and certain other animals and certain human souls—a hint that the power of fascination is natural magic.[3] In short, all use of occult virtue in nature may be classed as natural magic.

"The sense of nature."

Of William's statements concerning occult virtue we shall hear more under that head. But we may note here what he says of "the sense of nature," [4] which he calls "one of the roots of natural magic," which he often mentions, and which in his opinion accounts for a number of wonderful things.[5] It is "a sublimer sense than any human apprehension and nobler and more akin to prophecy." By it one senses the presence in the house of a burglar or harlot who is otherwise unperceived by any of the ordinary senses. By it some dogs can detect a thief in a crowd.[6] It is the mysterious power by which vultures foresee the coming battle, sheep detect the approach of the wolf, and the spider that of the fly. William tells of a woman who could feel the presence of the man she loved when he was two miles distant [1] and of another woman who so abhorred her husband that she fell into an epileptic fit whenever he entered the house.[2] In the main, this sense of nature seems about the same as what other writers call the power of natural divination. William, however, in several cases accounts for it by the strong sympathy or antipathy existing between the two persons or animals concerned.

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[1] I-i-46, (p. 627).

[2] *De legibus*, Cap. 24, ((pp. 67-68).

[3] I-i-43, (p. 612).

[4] "Sensus naturae," *De legibus*, Cap. 27, (p. 88).

[5] See pp. 875, 876 and 983 as well as the following reference. I-i-46, (p. 624).

[6] II-ii-70, (p. 870).

Magic's too extreme pretensions.

While William accepts such marvels and strange forces, there are many claims of magic which he refuses to grant.[3] As we shall see later he sets limits even to the powers of demons. Much less will he allow the extreme powers asserted of human magicians. In the books of the magicians appear subversions of nature of every sort. They would bind fire so that it cannot burn, robbers that they may not steal in a certain region, a well or spring so that no water may be drawn from it, and so with merchants and ships. They would even stop water from flowing down hill. William contends that such works are possible only by divine miracle, and that if the Chaldeans, Egyptians, and Arabs could really accomplish the lies in their books, they would have conquered the world long ago. Nay, the world would be at the mercy of any single magician or sorcerer (*magi seu malefici*). William then raises the objection that if two magicians tried to gain the same object at once, the magic of one or the other would prove a failure or they would both share an imperfect and half-way success, and in either case the promises of their art would prove a failure. The same logic might be applied to the advice how to succeed given to young men by some of our "self-made" millionaires (are they *magi* or *malefici?*) who have exploited natural resources. William, however, goes on to explain that the books of magic say that not all artificers are equally skilful or born under a lucky star. He points out the limitations of Pharaoh's magicians in much the usual manner.[1]

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[1] II-ii-69, (p. 869).

[2] II-ii-70, (p. 870).

[3] I-i-46, (p. 625).

Wax images.

William not only denies that magic can attain some extreme results, but also denies that some of the methods employed in magic are suited or adequate to the ends aimed at. He especially attacks the employment of images and characters, words, names, and incantations. The use of wax images in magic to harm the person or thing of whom the image is made seems to him a futile proceeding. He will not believe that Nectanebo—the magician of the Pseudo-Callisthenes, it will be remembered—could sink the ships of the enemy by submerging wax images of them.[2] Such magic images possess neither intelligence nor will, nor can they act by bodily virtue, since that requires contact either direct or indirect to be effective.[3] If someone suggests that they act by sense of nature, he should know that inanimate objects are incapable of this.[4] The only way in which the occasional seemingly successful employment of such images can be accounted for is that when the magician does anything to the image, demons inflict the same sufferings upon the person against whom the image is used, and thus deceive men into thinking that the virtue of the image accomplishes this result.[5]

Factitious gods.

Hermes Trismegistus speaks to Asclepius in the *Liber de hellera* or *De deo deorum* of terrestrial gods, associated each with some material substance, such as stones and aromatics which have the natural force of divinity in them.[6] Hermes, however, distinguished from natural gods "factitious gods," or statues, idols, and images made by man, into which "the splendor of deity and virtue of divinity" is poured or impressed by celestial spirits or the heavens and stars, "and this with observation of the hours and constellations when the image is cast or engraved or fabricated." William regrets to say that traces of this error still prevail "among many old women, and Christians at that." And they say that sixty years after their manufacture these images lose their virtue. William does not believe that there is divinity in stones or herbs or aromatics, or that men can make gods of any sort.[1] Minds and souls cannot be put into statues,[2] and William concludes that Trismegistus "erred shamefully" and "was marvelously deceived by the evil spirits themselves." [3] He also calls impossible "what is so celebrated among the astrologers (*astronomos*), and written in so many of the books, namely, that a statue will speak like a man if one casts it of bronze in the rising of Saturn.[4]

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[1] II-iii-22, (p. 1000).
[2] I-i-46, (p. 625).
[3] I-i-46, (p. 626).
[4] I-i-46, (p. 624).
[5] I-i-46, (p. 627).
[6] *De legibus*, Cap. 23, (p. 64): II-iii-22, (p. 999).

Characters and figures.

William likewise holds that characters or figures or impressions or astrological images have no force unless they are tokens by which the evil spirits may recognize their worshipers.[5] There is no divinity in the angles of Solomon's pentagon. William states that some are led into this error from their theories concerning the stars, and that the idolatrous cult of the stars distinguishes four kinds of figures: seals, rings, characters, and images.[6] Such are the rings and seal of Solomon with their "execrable consecrations and detestable invocations." Even more unspeakable is that image called *idea Salomonis et entocta,* and the figure known as *mandel* or *amandel.* So excessive are the virtues attributed to such images that they belong only to God, so that it is evident that God has been shorn of His glory which has been transferred to such figures. Artesius in his book on the virtue of words and characters asserts that by a certain magic figure he bound a mill so that the wheels could not turn.[7] But William is incredulous as to such powers in characters. He thinks that one might as well say that virtue of the figure would run the mill without water or mill-wheels. If the mill did stop, it must have been the work of demons. Nor can William see any sense in writing the day and hour when thunder was heard in that locality on the walls of houses in order to protect them from lightning.[1] It seems to him an attribution of the strongest force to the weakest sort of an incidental occurrence.

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[1] *De legibus,* Cap. 26, (p. 82).

[2] *Ibid.,* Cap. 27, (pp. 84 ff.).

[3] II-iii-22, (p. 999).

[4] *De legibus,* Cap. 26, (p. 84).

[5] *Ibid.,* Cap. 27, (pp. 86-87).
87).

[6] *Ibid.,* Cap. 23, (p. 65).

[7] II-iii-23, (p. 1003).

Power of words denied.

William indeed denies that there is magic power in mere words or incantations. Mere words cannot kill men or animals as sorcerers claim.[2] William argues scholastically that if spoken words possessed any such virtue they must derive it either from the material of which they are composed, air, or from their form, sound; or from what they signify. Air cannot kill unless it is poisoned by a plague, dragon, or toad. Sound to kill must be deafening. If what is signified by the word is the cause, then images, which are more exact likenesses, would be more powerful than words. William's opinion is that when sorcerers employ magic words and incantations they are simply calling upon the demons for aid, just as the worshipers of God sometimes induce Him to work wonders by calling upon His name.

Use of divine names.

This brings William to the delicate question of divine names. He censures the use of the name of God by "magicians and astronomers" in "working their diabolical marvels."[3] He also notes that they employ a barbaric name and not one of the four Hebrew names of God. They forbid anyone who is not pure and clad in pure vestments to presume to touch the book in which this name is written, but they try to gain evil ends by it and so blaspheme against their Creator. William, however, seems to feel that the names of God have a virtue not found in ordinary words and he states that not only servants of God but even wicked men sometimes cast out demons by making use of holy exorcisms.

Christian magic.

In short, incantations possess no efficacy, but exorcisms do. This is an indication, not merely of William's logical inconsistency, but also of the existence of a Christian or ecclesiastical variety of magic in his day. He will not believe in Nectanebo's wax images, but he believes that the forms of wax which have the likeness of lambs receive through the benediction of the pope the virtue of warding off thunderbolts.[1] He denied that magic words had efficacy through their sound but he affirms that consecrated bells prevent storms within the sound of their ringing, and that salt and water which have been blessed obtain the power of expelling demons. William, however, takes refuge in God's omnipotent virtue to explain the efficacy of these Christian charms.

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[1] *De legibus*, Cap. 27, (p. 89).

[2] *Ibid.*, (pp. 87-88).

[3] *Ibid.*, (p. 89).

Magic of sex and generation.

Magic appears to have always devoted considerable attention to matters of sex and generation, and William's works give one or two instances of this. He states that sorcerers investigate the cohabiting of certain animals, thinking that if they kill them at that hour they will obtain from their carcasses potent love-charms and aids to fecundity.[2] We are also told that men have tried to produce, and thought that they succeeded in producing human life in other ways than by the usual generative process.[3] "And in the books of experiments may be found mockeries of women similar to those which the demons called *incubi* work and which certain sorcerers have attempted and left in writing for posterity." They have recorded a delusive experiment by which women who have been known only once or twice think that this has occurred fifty or sixty times.

William's contribution to the bibliography of magic.

As has been already incidentally suggested, William offers considerable information as to the bibliography of magic in his day. Besides his many general allusions to works of magic, writings of sorcerers and prestidigitateurs and astrologers and books of experiments, he mentions several particular works ascribed to Aristotle and Avicenbros, to Hermes Trismegistus and Solomon, the "cursed book" of Cocogrecus on "Stations to the cult of Venus" and, what is perhaps the same, of Thot grecus on "The cult of Venus."[4] An Artesius or Arthesius, whom in one passage he calls a magician and cites concerning divination by water and whom in another passage he calls both a magician and a philosopher who had written a book on the virtue of words and characters,[1] is probably the same Artesius who is cited concerning divination by the rays of the sun or moon in liquids or mirrors in a work of alchemy in a twelfth century manuscript,[2] and further identical with the Artephius who Roger Bacon says lived for one thousand and twenty-five years,[3] to whom a treatise is ascribed in the *Theatrum Chymicum*[4] and a Sloane manuscript,[5] and who seems to have been the same as Altughra'i, a poet and alchemist who died in 1128.[6] There also are a number of magic books of which William does not give the author's name or the title, but of which he gives descriptions or from which he makes citations which would be sufficiently definite to identify the works should one meet with them elsewhere. In our chapters on pseudo-literature and experimental literature we treat of many of these works.

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[1] *De legibus,* Cap. 27, (p. 84).

[2] *Ibid.,* Cap. 4, (p. 34).

[3] II-iii-25, (p. 1010).

[4] II-ii-96, (p. 895).

Plan of the rest of this chapter.

From our survey of magic proper as delineated in William's works we now turn to what he represents as the two chief forces in magic, namely, the demons and the occult virtues in nature, and to two subjects which he closely connects with magic, namely, divination and astrology. These four topics will be taken up separately in the order stated.

The theory of spiritual substances.

Since William attributes so much of magic to demons, it is important to note what he has to say concerning these "spiritual substances." He proposes to follow as his sources on the subject "authentic accounts" (*sermones authentici*): first of all the statements of the divinely inspired prophets, and after that the opinions of the philosophers and also of the magicians. He observes elsewhere, however, that there is a lack of literature on the subject; the sages have only dipped into it and not yet plumbed it to its depths: in fact, only the treatise of Avicenbros has come to his hands, and while that authority has said and written many sublime things, far removed from popular comprehension, still he has made only a beginning in this field.[1] William also utilizes, however, the works of Hermes Trismegistus [2] and other books of necromancy and magic—among them Thot Graecus [3]—the testimony of medical men [4] and "innumerable experiences" of men at large.[5]

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[1] *De universo*, pp. 996-7, also 1003; *De legibus*, cap. 27 (p. 89).

[2] Berlin 956, 12th century, fol. 21, Hic incipit alchamia. . . .

[3] Bridges, II, 212.

[4] *Theatrum Chymicum*, Strasburg, 1613, IV, 221.

[5] Sloane 1118, 15th century, #28. Arthephii capitulum ex opere solis extractum.

[6] Gildemeister in *Zeitsch. d. Deutsch. Morgenl. Ges.* XXXIII, 534: cited by Lippmann (1919), 408.

William professes himself open to conviction and new light on the question of the assumption of bodies by good and bad spirits.[6] And it must be said that his whole treatment of spirits is full of inconsistencies and difficulties. Part of the time he draws a hard and fast line between spiritual substances and physical creation, but only part of the time. He also essays the difficult task of explaining how and to what extent these spiritual substances are able to disturb physical creation, and how far they in turn are affected by it.

Spirits in the heavens.

To begin with, William takes up the difficult position—or rather he makes it difficult for himself—but the usual one with medieval theologians, that angels occupy physical space and are located in their own heaven as the stars are in theirs.[7] Some modern believers in spiritualism hold a very similar position.[8] He also declares that the tenth and last or empyrean heaven will be the eternal abode of men whose souls are saved, although the resurrected bodies of the saved would presumably still be corporal substances.[1] This raises the further difficulty that apparently the empyrean heaven cannot be the abode of the angels, as some theologians and saintly doctors have held (for a corporal place cannot be filled except with corporal substances), for those superficial persons who mock the authentic divine revelation of scripture will say that "if that heaven is a corporal place it cannot be filled except by corporal substances."

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[1] *De legibus,* Cap. 26, (pp. 81-82): I-i-44, (p. 613).

[2] *De universo* II-ii-37, (p. 831): II-ii-100 (p. 898).

[3] *Ibid.,* II-ii-96, (p. 895).

[4] *Ibid.,* II-iii-13, (p. 982): II-iii-24, (p. 1007).

[5] *Ibid.,* II-ii-63, (p. 860): II-ii-70, (p. 871): II-iii-6, (p. 968): II-iii-17, (p. 988).

[6] *Ibid.,* II-iii-24, (p. 1007).

[7] *Ibid.,* II-ii-84 and 85, (pp. 885-6).

[8] Among errors condemned at Paris in 1240 by William as bishop the seventh was "that neither glorified souls nor glorious or glorified bodies will be in the empyrean heaven with the angels but in the watery or crystalline (heaven) which is above the firmament. Which they even presume to say of the blessed virgin. On the contrary it should be believed that there is the same place for holy angels and souls of the blest, namely, the empyrean heaven," etc.

The eighth error was "that an angel can in the same instant be in different places and is everywhere if he wishes to be everywhere."

These errors and various other sets of errors condemned at Paris and Oxford are printed in an incunabulum numbered IA. 4778 in the British Museum.

Will hell be big enough?

Another point which puzzles William is whether there will be room in hell for all the evil spirits and resurrected bodies of the damned destined to make it their ultimate abode. The infernal regions, located in the interior of our terrestrial globe, seem very small to him compared with the vast expanse of the empyrean heaven which is even greater than that of the fixed stars. And our earth is a mere dot compared to the sphere of the fixed stars. If then that entire empyrean heaven is to be filled with glorified men, how shall the infernal regions hold all the damned?[2] It will be seen that Dante's later cosmology is very similar to William's.

Astrological necromancy.

William will not agree, however,[3] with the books of magic and the masters of images and illusions that the starry heavens and even single planets are inhabited by spirits so that the circle of the moon has fifty ministering spirits and that there are also angels in the twelve signs of the zodiac. On the other hand, in an earlier chapter he makes the statement that he has never heard anywhere even in magic books of demons with power over celestial bodies.[4] William is of the opinion that Aristotle was deceived by an evil spirit into boasting that a spirit had descended to him from the circle of Venus.[5] William argues that the starry heavens are

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[1] *De universo* I-i-34, (p. 595 ff). Also Cap. 43 (pp. 609 to 611).

[2] Who William believes will exceed the saved in numbers: "De multitudine vero damnandorum omnis lex determinatum habet apud se quod multo maior futura sit multitudine glorificandorum." The passage has already been quoted in HL XVIII, 371-2.

[3] *De legibus*, Cap. 24, (p. 73.) *De universo* II-ii-96, (p. 895).

[4] *Ibid.*, II-ii-70, (p. 871).

[5] *Ibid.*, II-ii-39 and 98, (pp. 833 and 897) and II-iii-6, (p. 967): also II-ii-96, (p. 895).

rational and able to regulate themselves and do not require any ministering angels; and on the other hand that the nobler spirits would not debase themselves by ministering to mere celestial *bodies.*[1] William's own theory is that demons dwell in the air about the earth and not in the planetary heavens. He also speaks in one passage of their especially frequenting deserts.[2]

False accounts of fallen angels.

William also rejects [3] some non-Christian assertions concerning fallen angels. One is the statement of the author of a book of sorcery, who claimed to have communed with spirits thirty years, to the effect that new spirits are created daily, and that there are twelve orders of them, and that every day a multitude of them fall and that they fall into different regions of the earth and there rule—some in deserts, some in woods, some in fountains and rivers, some in herbs and trees, some in gems and stones, which thus derive their marvel-working qualities from them. The other account rejected by William is a pretty story from Hermes to this effect.[4] When two angels were critcizing mankind harshly for its sinfulness God incarnated them to see how much better they would do. Both promptly fell in love with a beautiful woman who would return their love only on condition that they renounce God. When they had done even this, God called them to heaven, reproved them for not having justified their criticism of sinful mankind, and told them to choose now their place of punishment. They selected the air, but later through the prayers of a prophet in Babylon were shut up in a cave to await their final punishment at the last judgment.

Different kinds of spirits.

William of course makes the usual sharp Christian distinction between good spirits or angels and bad spirits or demons. It is the latter alone, rather than spiritual substances in general, whom he connects with magic, although naturally the magicians themselves often claim to employ good spirits. William is in doubt whether fauns and pygmies and some other monsters are demons or animals or men.[1] He also lists satyrs, *joculatores,* incubi, succubi, nymphs, Lares, Penates and other old Latin names such as *cloacina, Lucina, limitanus, priapus, genius, hymenus.*[2] He regards as a delusion the belief fostered by old-wives in demons who injure infants.[3] Despite his mention of incubi and succubi and despite the verses of Scripture about the sons of God and the daughters of men and that woman ought to veil her head on account of the angels, he regards demons as incapable of sexual intercourse with human beings, but he thinks it possible that they may juggle with nature so as to produce the effects of sexual intercourse.[4] He mentions the belief in a demon who comes to cellars at night in women's clothing and bestows abundance and prosperity where food and drink is left uncovered for it to partake of, which it does without diminishing the quantity. "And they call her *satia* from satiety."

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[1] *De universo,* II-ii-97, (p. 896).

[2] *De legibus,* Cap. 9, (pp. 38-39).

[3] *De universo,* II-ii-29, (p. 820) and II-iii-6 to 8, (pp. 966 to 973).

[4] *Ibid.,* II-ii-37, (p. 831): II-ii-100, (p. 898).

Limited demon control of nature.

What is the extent of the control over matter exercised by the demons in performing marvels? In discussing what demons can and cannot perform in the ways of marvels, William's decisions seem rather arbitrary and capricious.[5] He grants them superhuman powers of divination and says that it has been repeatedly proved that they know when invocations and sacrifices are made to them.[6] But the apparitions which they produce are neither real objects nor images in the air but thoughts and pictures in the mind of the beholder.[7] The armies of horsemen produced by necromancers leave no prints of hoofs behind them and their elaborate castles with gates, towers, walls, and citadel completely vanish without leaving a trace.[8] This explains how enchanters and magicians can apparently cut horses in two, although William grants it not unlikely that there may be other ways of doing this for those "who know the marvellous occult virtues of many things." William also discusses how demons can toss sticks and stones about, throw persons out of bed, and transport men or huge rocks for great distances when they have neither necks nor shoulders to carry them on.[1] This is no more strange, he says, than the magnet's ability to draw iron.[2] He believes that the virtue of spiritual substances can overcome weight which holds bodies at rest and produce lightness which makes motion easy. It was thus that an angel transported one of the Hebrew prophets to Babylon by a lock of his hair. It is doubtful, however, if this last could have been accomplished save by divine aid. He doubts furthermore if horses could be generated as the frogs were by the Egyptian magicians of Pharaoh. The generation of frogs is a much easier and more rapid process. Also the wax lights which mysteriously appear in stables on the horses' manes and tails would be easy for demons to make.[3] But William disbelieves in such magic transformations as werwolves. His explanation is that the devil first made the man imagine himself a wolf and then caused a real wolf to appear and frighten people.[4] Demons cannot make idols or images speak, but when the bodies of human beings are possessed by demons, they form voices after a fashion, although, as exorcists have assured him, in a raucous tone unlike the usual human voice, probably because the vocal chords respond but indifferently to demoniacal abuse of them.[5]

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[1] *De universo,* II-iii-7, (p. 970).

[2] *Ibid.,* II-iii-12, (pp. 976-7).

[3] *Ibid.,* II-iii-24, (p. 1004).

[4] *Ibid.,* II-iii-25, (pp. 1009-10).

[5] *Ibid.,* II-iii-23, (p. 1000).

[6] *De legibus,* Cap. 24, (p. 67).

[7] *De universo,* I-ii-21, (p. 680), and II-ii-63, (p. 860).

[8] *Ibid.,* II-iii-12, (p. 979).

Can demons be imprisoned or enter bodies?

William is sure that demons cannot be imprisoned against their will in material bodies, whether rings, gems, mirrors, or glass phials such as Solomon is said to have shut them up in.[6] William argues that if a man died in a huge corked bottle his soul would be able to get out. William, however, believes his Bible when it tells him of demons shut up in men whom "they vex with innumerable tortures," or in swine or in lakes,[1] although he declares that he does not adduce the case of demons in swine because it is recorded in the Bible but because it is attested by the experience of many. And he declares that even to his day demons give most certain indication of their presence in lakes when stones are thrown in or they are provoked by some other movement or sound.[2] He states, however, that many medical men deny that human beings are possessed by demons and attribute the seizures and agitations to fumes and vapors.[3] Many skilled doctors also dispute the existence of the nocturnal demon called *ephialtes* and attribute the oppressive feeling to action of the heart and not to the weight of a demon. In this instance William is inclined to agree with the physicians.[4] William holds that it is useless to strike at demons when they appear before you, for you merely beat the air, as many experiments have shown.[5] But he believes that demons can be punished not only by material hell fire but by contact with the other three elements, air, earth and water.

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[1] *De universo,* II-ii-70, (p. 871).

[2] *Ibid.* (p. 1001).

[3] *Ibid.* (pp. 1003-1004).

[4] *Ibid.,* II-iii-13, (p. 983).

[5] *De legibus,* Cap. 26, (p. 83-4).

[6] *De legibus,* Cap. 26, (p. 81).

Susceptibility of demons to the four elements and to natural objects.

Demons feel any affront offered or indignity done them very keenly so that saints have often routed them by a volley of spit. William is also inclined to accept the "ancient opinion among the Romans" that human urine dissolves works of magic.[6] Furthermore there are several natural objects which have the occult virtue of driving away demons, a peony suspended from the neck—Galen's old remedy for the epileptic boy—or the top of the heart of a certain fish placed on the coals. If it is asked how it is that these proud spiritual substances are thus subject to the virtues of physical bodies, William can only answer that it is probably in consequence of their fall, which also subjected them to hell fire. William's logic simply reduces to this, that God can do anything He pleases with demons while men can do nothing with them against the demons' wills and without imperiling their own souls.

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[1] *De universo*, II-iii-6, (p. 968).
[2] *Ibid.*, II-iii-17, (p. 987).
[3] *Ibid.*, II-iii-13, (p. 982).
[4] *Ibid.*, II-iii-24, (p. 1007).
[5] *Ibid.*, II-iii-17, (p. 988).
[6] *Ibid.*, II-iii-22, (p. 999).

Stock examples of natural marvels.

William is as credulous concerning the marvelous powers attributed to herbs, gems and animals, and as anxious to find some plausible explanation of their validity, as he was sceptical in regard to images, characters and words. We encounter once more in his pages many of the stock examples of natural marvels which we have met again and again in previous writers and shall find in many writers after him. He rhapsodizes concerning the power of the magnet and mentions its three species according to Hermes (Mercurius).[1] He tells of the phoenix, of the masculine and feminine palms, and of theriac.[2] Indeed, the magnet, the palms, and the story of the hazel rod told below are all introduced while William is supposedly discussing divine providence. In more than one passage he tells—perhaps directly from Pliny—of the stupefaction produced by the *torpedo* in persons who touch it only with a long stick, of the little *echinus* or *remora* which stops great ships, or of the powers of lion and basilisk, and of the gem heliotrope which aided by the virtue of the herb of the same name renders one invisible.[3] For this assertion concerning heliotrope, however, which Pliny stigmatized as an example of the magicians' impudence,[4] William cites the writings of experimenters.

The hazel rod story.

On the other hand, a passage in William's work concerning the property of a hazel rod was repeated within a few years by at least three writers: Albertus Magnus, John of St. Amand, and Roger Bacon. William relates that men say that if the rod is split in two lengthwise the halves will approach one another again of their own accord and reunite.[5] Deceivers attribute this to the virtue of certain words which they utter, but it is by virtue and sense of nature.

William regards the occult virtue of things on this earth as so certain that he uses it to argue that the stars too must

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[1] I-iii-11, (p. 731: also pp. 756-57).

[2] I-ii-16, (p. 668): II-iii-22 (p. 999).

[3] II-ii-73, (p. 873): II-iii-22, (p. 998): II-iii-16, (p. 986): I-i-46, (p. 621).

[4] NH 37, 60.

[5] I-iii-11, (p. 731).

Occult virtues of herbs and animals.

possess great powers.[1] This is attested "from the operations of the virtues of other things, both animals and parts of them, also herbs, medicines, and stones." [2] Of medicines he especially recommends the *empirica* to the reader's consideration.[3] The virtues of herbs have been proved to be very numerous and very marvelous.[4] As for animals, after describing the virtues of the basilisk, William adds, "and when you have heard similar and maybe greater things concerning the occult virtues of other animals, you will not marvel at these." Among many medicines which prolong life he believes that the flesh of snakes has great renovating virtue,[5] and among medicines supposed to produce visions and revelations he names the eye of an Indian tortoise and the heart of the hoopoe,[6] which are thought to clear the soul of noxious vapors in sleep and pave the way for illuminations. William suggests that these substances may horrify one so as to shock the soul free from the body. He even mentions a medicine the smoke from which in the room in which one is sleeping will free the soul from the body so that it emerges into the region of light and the luminosity of the Creator.[7] And in the case of the little fish which binds ships so that they cannot move, he holds it indubitable that this cannot possibly be done by any bodily virtue which it possesses and must be by some spiritual virtue which exists in its soul.[8] This reminds him of the power of the human imagination as shown in the case of the man who cast down a camel by merely imagining its fall.[9]

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[1] I-i-46, (p. 621).

[2] The influence of this passage is seen in a MS at Paris which was once the property of the humanist Budé: BN nouv. acq. 433, anno 1486, fol. 1: Excerpta from William of Auvergne, "et primo ex capitulo de virtutibus occultis quorundam animalium herbarum et lapidum relatorum ad consideracionem astronomicam et astronomorum, ut plurimum, errancium."

[3] II-ii-76 (p. 876), necnon et exemplis occultarum operationum et mirabilium quaeque nonnulli medicorum et etiam quidam philosophorum naturalium empirica vocant.

[4] II-iii-22, (p. 999).

[5] I-i-59. (p. 639).

[6] II-iii-21, (p. 997).

[7] II-iii-20, (p. 995).

[8] II-iii-16, (p. 986).

[9] This illustration is also used by Peter of Abano, *Conciliator,* Diff. 135; and is found in the 219 opinions of Siger de Brabant and others condemned at Paris in 1277 (see below, Chapter 62).

Virtues of gems.

To the virtues of gems William alludes a number of times. He recounts how the sapphire of its own motion springs into a diseased human eye and cleanses it of its noxious humors.[1] He also finds it asserted that the emerald attracts riches to its owner and that the topaz checks the passions of avarice, cupidity, luxury, and evil desire. He endeavors to explain how it may be possible for the stone heliotrope to render one invisible; as the power of the stone turns the brightness of the sunlight to a ruby shade, so it may be that the potency of its color prevents the spectators from discerning at all the color of the man who wears it, just as it is said that a musical instrument strung with snakeskin drowns the sound of all other instruments.[2]

A medley of marvelous virtues.

Some of the virtues ascribed to natural objects William finds almost too marvelous for belief, but then strengthens his faith by recollecting some others which are more marvelous still, as the following passage will illustrate.[3] The experimenters have put in their books the marvelous statement that the presence of a serpent or of a reed containing some quicksilver affects sorcerers and magicians so that their juggleries and incantations are of no avail. William, who it will be recalled had elsewhere denied the ability of a magic figure to stop a mill-wheel, is also inclined to question whether serpents or quicksilver have any power over evil spirits and incantations. But then he remembers that the experimenters also assert that a crab hung in mid-air keeps moles who move underground out of the field and that the herb peony drives devils out of demoniacs. Since the peony has many virtues necessary for men and demons hate men, William thinks it likely that they hate the herb too, and flee from it, when it is suspended about one's neck. And in one of the books of the Hebrews it is expressly stated that one of the holy angels said that the top of the heart of a certain fish placed on live coals would drive any kind of demon out of men or women. This book is received as authentic by both

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[1] I-i-46, (p. 621).

[2] II-iii-22, (p. 998).

[3] II-iii-22, (p. 999).

Hebrews and Christians, and William also regards an archangel as a good authority. This being established, he sees no reason why a snake may not have power over demons too. He recalls too the ancient belief among the Romans that human urine dissolves all works of magic; the manifest fact that jasper drives away snakes and that eagles place it in their nests for this reason; and that the gem achates or agate taken powdered in drink causes the unchaste to vomit. In Great Britain they test the morals of boys and girls by this experiment. This property of the agate causes William to marvel much, for he sees no connection between stones and virginity. However, if the agate is incompatible with unchastity, what wonder if quicksilver will not tolerate the working of magic in its presence?

It has been made evident that William accepts very extreme powers in natural objects and that with such resources the possibilities of his natural magic should be well-nigh unlimited. If he does not quite believe in all these marvels, he does not definitely deny them, and evidently enjoys repeating them.

Divination not an art but revelation.

William states that the proper meaning of divination is imitation of the deity, but that the term is usually not applied to the revelations made by good spirits and prophets but to the revelation of hidden things, especially the future, by evil spirits.[1] For he also affirms that divination is not a human art but a matter of revelation. The medical prognostications of physicians, although they may seem occult to other men, are based on experience of their art and astronomers are not called diviners but men of learning. While William may deny that the diviner is an *artifex*, he has to admit that some diviners use tools or materials and so give their predictions the appearance of being based upon some art.

Divination by inspection of lucid surfaces.

Of this type is the practice of predicting the future by gazing upon polished and reflecting surfaces which are rubbed with oil to increase their lucidity.[2] Among the substances employed are mirrors, two-edged swords, children's finger-nails, egg shells, and ivory handles. Usually a boy or a virgin is employed to gaze thereupon, and sometimes exorcisms, adjurations, and observance of times are added. William affirms that many experiences have demonstrated that only one boy out of seven or ten sees anything therein, and he is of the opinion that the whole apparatus simply conceals "the impiety of diabolical sacrifices." Some ancient sages, nevertheless, notably Plato, have thought that the soul of the gazer is thrown back upon itself by the luminosity of the object seen and then exercises its latent powers of natural divination. We sometimes see such revelations by the irradiation of spiritual light in the insane, the very ill, dreamers, and those in whom because of great fright or care the mind is abstracted from the body.[1] William therefore finally concludes that the theory of the philosophers as to divination by inspection of lucid bodies "is undoubtedly possible," but he still maintains that demons are often involved.

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[1] II-iii-18, (p. 989).

[2] *Ibid.* and *De legibus,* Cap. 24, (p. 68).

Other instances of divination, ancient and modern.

William also tells us of an ancient Latin magician who believed that the soul of an immaculate boy who had been slain by violence would have knowledge of past, present and future.[2] He therefore murdered a boy, and then went insane himself and imagined that he heard responses from the boy's soul. This was surely the work of demons. Other ancient philosophers blinded boys or themselves in order to increase the power of the soul in divination.[3] William further mentions the old-wives of his own time who still persisted in divination and interpreting dreams and could not be made to desist even by beatings.[4] He states that these old women still cherished the superstition of the augurs that if you find a bird's nest with the mother bird and little ones or the eggs, and preserve it intact, all will go well with you, while if you harm it or separate any bird or egg from it you will encounter ill fortune.[5]

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[1] II-iii-20, (p. 993).
[2] II-iii-19, (p. 990).
[3] II-iii-20, (p. 994).
[4] I-iii-27, (pp. 750-51).
[5] *De legibus,* Cap. 2, (p. 31).

His treatment of astrology.

William has much to say in his various works of the heavens and the stars, and he rarely overlooks an opportunity to have a tilt with the astrologers. Most of his statements and arguments had been often employed before, however, and he also repeats himself a great deal, and his long-drawn scholastic listing and rebutting of supposed reasons pro and con at times becomes insufferably tedious. We shall therefore compress his treatment to a very small space compared to that which it occupies in his own works and words.

The philosophers on the nature of the heavens and stars.

William states that Plato and Aristotle, Boethius, Hermes Trismegistus, and Avicenna, all believed the stars to be divine animals whose souls were as superior to ours, as their celestial bodies are.[1] Since these philosophers regarded the stars as nobler, wiser, and more powerful than mortals, they made them guardians and guides of humanity, and distributed all earthly objects under their rule. Such doctrines William recalls examining when he was young in the books of judicial astrology and the volumes of magicians and sorcerers, from whom he would appear to distinguish the above-named philosophers none too carefully. He indeed explicitly classes "Plato and Aristotle and their followers" with "those who believe in judgments of the stars."[2] He also tells us that Plato regarded the entire universe as one divine animal, and that his followers regarded the tides as the breathing of this world animal; but that Aristotle and his school included only what is above the moon or even only the heaven of the fixed stars.[3] Avicenna, too, called the heaven an animal obedient to God.

William's own opinion and attitude.

William himself is inclined to think that the divisions and diversities of the nine spheres militate against their being animated by a single soul; and he rejects the theory that the world soul is composed of number and musical consonance.[4] But he leaves Christians free, if they will, to believe with the Aristotelians and many Italian philosophers that the superior world is either one or many animals, that the heavens are either animated or rational.[1] In this he sees no peril to the Faith; but hitherto Hebrew and Christian doctrine has not explored such matters, and Christians have been too absorbed in saving men's souls to note whether the heavens had souls or no. It would indeed be strange if William denied the starry heavens some sort of soul or souls when he has attributed one to a sea-fish like the echinus.[2] But he declares that "it is manifest that human souls are nobler than those which they put in heavenly bodies." And he warns against the wicked error of identifying the Holy Spirit with the world soul. We have noted elsewhere his hostility to the theory of astrological necromancy that the heavens and stars are full of ministering spirits. He also contraverts the Aristotelian doctrines that there are as many intelligences moving the heavenly bodies as there are celestial motions and that the heavens love superior intelligences and strive to become assimilated to these.[3]

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[1] *De legibus,* cap. 25 (p. 75). *De universo,* I-iii-27, (p. 751).

[2] I-iii-28, (p. 753).

[3] I-iii-27, (pp. 751-2).

[4] I-iii-30, (p. 757).

Objection to stars as cause of evil.

Like most Christian apologists William adopts the argument that the stars, if rational, would not cause evils and misfortunes such as astrologers predict, and seems to think that all the evil in the world can be charged to the account of human perversity or the imperfections inherent in the matter of our inferior world, and that for these two sources of ill neither God nor the stars should be held responsible.[4] He recognizes, it is true, that someone may argue that these evils exist by the will of the Creator, whose will is nevertheless always good, but he does not seem to see that the same reasoning may be applied to the rule of the stars. He seems to regard as a new discovery of his own and a point hitherto unrecognized by astrologers, the argument that ineptitude on the part of inferior matter receiving the force of the stars may account for many effects apparently due to the heavens. But in thinking this argument novel he is much mistaken. Really his only point here against astrologers is that some of them are careless in their phraseology and speak of the stars as causing evil, which he regards as blasphemy of Him who created the stars. "And all blasphemy against the Creator," continues William in a truculent and intolerant tone which reveals the spirit of the medieval inquisition, "is an impiety to be exterminated with fire and sword."

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[1] I-iii-31, (p. 759).

[2] I-ii-29, (p. 693).

[3] I-ii-5, (p. 650): II-i-45, (p. 794): II-i-4, (p. 763).

[4] I-i-46, (pp. 618-23).

Virtues of the stars.

William raises certain difficulties in regard to astrological technique only to answer them himself. And he grants that fixed stars which seem close together may really be separated by vast distances and so have very different virtue. And he cannot deny "many marvelous and occult virtues" in celestial bodies, when he admits "so many and so great occult virtues" in terrestrial bodies. Indeed all philosophers agree that the virtues of the stars far surpass even those of precious stones. The variations in the heat of the sun, while its course continues constant, seem to William a sure indication that the other planets and fixed stars participate in influencing our world.

Extent of their influence upon nature and man.

While William was not unwilling to concede souls or reason to the stars, he believes that it is perilous for Christians to regard the souls of the heavens as "governors of inferior things and especially of human affairs."[1] Those who hold that man's actions are caused of necessity by the motion of the sky and the positions of the stars, ruin, in his opinion, the foundations of law and morality.[2] "Against that error, one ought not so much to dispute with arguments as fight with fire and sword." Some have argued that because stars and lights were created before vegetation, animal life, and human beings, they are causes of these others, both generating and regulating them.[3] In favor of this contention so much has been written that it can scarcely be read, says William, and the stars do give much aid in generation and in conservation of generated things, but not so much as the astrologers think.[4] They should not be consulted even

[1] I-iii-28, (pp. 753-4).

[2] I-iii-20, (p. 740).

[3] I-i-42, (pp. 606-7).

[4] I-i-46, (pp. 627-8).

as signs—rather than causes—in human concerns.[1] In our sublunar world their power extends only to the four elements and four humors and only to such animals composed of these as lack free will and obey natural necessity. Thus William really excludes only human free will and intellect from sidereal control,[2] and he admits that "the multitude and populace from want of intelligence and other evil dispositions lives almost after the manner of brutes," following natural impulse to a great extent, so that astrologers may predict popular agitations and mob uprisings with a fair degree of accuracy, but should not predict concerning individuals. Even in the case of individuals, however, he does not deny that natural virtues and vices are attributable to the stars, such vices, for instance, as irascibility, levity, and lubricity, which medical authorities ascribe not to moral fault but physical constitution.[3] William would limit the influence of the stars not only by individual freedom of the will but by the power of prayer.[4] He does not believe the decrees of fate so fixed and the laws of nature so unchangeable that God's wrath may not be placated by prayer, and freedom from any threatening evil obtained from His goodness. Belief in the power of the stars and belief in the power of prayers: which is the more superstitious, which the more nearly scientific? Or which belief has led to progress in science?

Against nativities, interrogations, and images.

William complains that "Ptolemy and Haly and other astronomers" have attributed original sin and all its consequences to the constellations and hours of nativity, in that they have presumed to write books of horoscopes and nativities.[5] He feels it "necessary to say something against that insanity" because of the great reputation such famous writers have among the "simple and stupid multitude" which regards them as profound sages and sublime prophets. Into William's particular arguments against the art of casting nativities, which much resemble the arguments of Augustine and John of Salisbury, we will not go. Elsewhere he also attacks the practice of interrogations.[1] He also strongly objects to the books which he says astrologers have written on discovering men's secret thoughts through the significations of the stars.[2]

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[1] I-iii-31, (p. 759).

[2] I-i-46, (pp. 628-9).

[3] *Ibid.*, (p. 620).

[4] *Ibid.*, (p. 626).

[5] *De vitiis et peccatis*, cap. 6, (p. 264).

William has much to say against astrological images, but his attitude has already been partially indicated in stating his attitude towards images, figures, and characters in general. He declares that belief in astrological images "derogates more from the honor and glory of the Creator than the error which attributes such virtue to the stars and luminaries themselves." It seems to him "a strange and quite intolerable error to think that stars which cannot help themselves can bestow such gifts as invincibility, social graces, temperance or chastity." [3] Yet elsewhere we have heard him mention with seeming complaisance the bestowal of riches and checking of evil passions by emeralds and topazes. His best argument as against figures and characters in general is that such lifeless bodies cannot produce intellectual and moral effects in living human beings, especially when the engraved gems are, as is usual, hidden away somewhere, or buried underground.

Astrology and religion and history.

William condemns as error the association of the world's leading religions with the planets, as Judaism with Saturn, Islam with Venus, and Christianity with the sun.[4] The stars, he declares, are subject to religion, not religion to the stars, and Joshua made even the sun and moon stand still. William is candid enough to recognize that the seven-branched candlestick in the Jewish tabernacle designated the seven planets, but elsewhere states that the Mosaic Law forbade observation of the stars.[5] William also considers the doctrine of the *magnus annus* or Platonic year, that after 36,000 solar years history will repeat itself down to the minutest detail owing to the recurrence of the former series of positions of the constellations.[1] Since this has the support of men of great reputation, he lists various arguments advanced in its favor and rebuts them in detail.

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[1] *De legibus*, cap. 20, (p. 55).

[2] I-i-46, (p. 628).

[3] *De universo*, I-i-46, (pp. 622 ff). *De legibus*, cap. 23, (p. 65).

[4] *Ibid.*, cap. 20, (p. 53).

[5] *Ibid.*, cap. 2, (p. 31): I-i-46, (p. 628).

Comets and the star of Bethlehem.

William believes that comets appear in the sky and in the air "as signs of slaughters and other great events in the world." He mentions "the universal belief" that they foretell the deaths of kings and political changes.[2] But he asserts that the star announcing Christ's birth was not of this sort and that the darkness at the time of the Crucifixion was not due to an ordinary eclipse.

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[1] I-ii-16 and 17, (pp. 667-9).

[2] I-i-46, (p. 629).

CHAPTER LIII

THOMAS OF CANTIMPRÉ

De natura rerum; date, authorship, and relation to similar works—Life of Thomas—Character of the *De natura rerum*—Plan and contents—Chief authorities—Embodiment of long extracts—Other citations—Credulous attitude—Very uncritical character of the *Bonum universale de apibus*—A chapter on the lion—Different kinds of lions: their generation—Disposition and behavior—Fear inspired and felt by lions—Their diet, medicine, and mode of fighting—Medical virtues of the lion's carcass—Medieval and modern encyclopedias compared—Examples of the zoology of the Experimenter—Fish, worms, and toads—Solomon's experiment in worms—Trees—Marvelous virtues of stones—An adamantine mariner's compass—The mariner's compass and magic—Occult virtues of sculptured gems—Thetel on images on stones—Zahel or Zaël the Israelite—Consecration of gems—The seven metals: modern plumbing—The seven regions of the air—Astrological—Elements and spirits—Other works incorrectly ascribed to Thomas of Cantimpré—Appendix I. The Manuscripts of the *De natura rerum*—Appendix II. Some Manuscripts of the Treatise of Thetel on Seals.

De natura rerum; Date, authorship, and relation to similar works.

WE now approach the consideration of two works with titles similar to Alexander Neckam's *On the Natures of Things,* namely, Thomas of Cantimpré's *On the Nature of Things* [1] and Bartholomew of England's *On the Properties*

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[1] Only extracts of the *De natura rerum* have been printed (by J. B. Pitra, *Spicilegium Solesmense,* III, and in HL and *Ferckel* as noted below). Some discussion of the MSS and a partial list of them will be found in Appendix I to this chapter. I have chiefly used MSS Royal 12-E-XVII, 13th century; Royal 12-F-VI, 14th century; Egerton 1984, 13th century, fols. 34-145; Arundel 323, 13th century, fols. 1-98; and Arundel 164, 15th century, at the British Museum; and BN 347B and 523A at Paris. As any topic to which a chapter is devoted can be found without much difficulty in these MSS, which are divided into books and chapters and equipped with tables of contents, I shall usually not take the time and space to make specific citations by folio in the ensuing chapter.

Of Thomas's *Bonum universale de apibus* I have used the 1516 edition.

Some books and articles on Thomas and his natural science are: Bormans, "Thomas de Cantimpré indiqué comme une des sources où Albert le Grand et surtout Maerlant ont puisé les matériaux de leur écrits sur l'histoire naturelle"; in *Bulletins de l'Acad. roy. des Sciences de* *of Things.* These two works are much longer and more elaborate than Neckam's, containing each nineteen books, whereas of his five books only two really dealt with the natures of things, and they lead up to the later and still better known natural encyclopedia of Vincent of Beauvais. Thomas and Bartholomew were contemporaries and it is difficult to say whose book was finished or appeared first but we shall consider Thomas first. As he says that he spent fourteen or fifteen years in collecting his material, he perhaps began to write first and his work seems to reflect a somewhat less developed state of learning. Thomas is later than Michael Scot whom he cites, while an allusion to Jacques de Vitry as the most recent of his authorities and as now bishop of Tusculum and a cardinal indicates that the work was finished between 1228 and 1244. On the whole Thomas and Bartholomew seem to have compiled their works independently, employing different general plans, emphasizing rather different fields, and using somewhat different authorities. Possibly, therefore, the two works may have been completed almost simultaneously, and one wonders whether they may not have represented rival ventures of the two friar orders. Bormans and Rose[1] after him have dwelt on the use made of Thomas's compilation by his fellow Dominicans, Vincent of Beauvais and Albertus Magnus, but I have little doubt that most of his sources were known to them directly. The *De natura rerum* remained long in use; an official price

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Belgique, XIX, 132-59, Brussels, 1852.

Carus, *Geschichte der Zoologie,* Munich, 1872, pp. 211-33.

HL 30 (1888) 365-84, Delisle, "La Nature des Choses, par Thomas de Cantimpré," supplementing and correcting the earlier account by Daunou in HL 19 (1838) 177-84, where the *De natura rerum* had been called an anonymous work known only from Vincent of Beauvais' citation of it.

A. Kaufmann, *Thomas von Chantimpré,* Cologne, 1899, 137 pp., an unfinished work published posthumously without a projected section on Thomas's natural science, which the author had scarcely begun.

Stadler, "Albertus Magnus, Thomas von Cantimpré, und Vincent von Beauvais," in *Natur und Kultur,* IV, 86-90, Munich, 1906.

C. Ferckel, *Die Gynäkologie des Thomas von Brabant, ausgewählte Kapitel aus Buch I de naturis rerum beendet um 1240,* Munich, 1912 (in G. Klein, *Alte Meister d. Medizin u. Naturkunde*).

[1] V. Rose (1875), pp. 335, 340.

was fixed for it at the University of Paris in the reign of Philip the Fair;[1] and the manuscripts of it are numerous and widespread, but as yet often unidentified because in the manuscripts themselves it is either anonymous or ascribed to Albertus Magnus.[2] This attribution to Albert is found even in a manuscript of the thirteenth century, while "Albert in the book *De naturis rerum*," is cited in the *Thesaurus pauperum*[3] by Petrus Hispanus, a work written at some time before 1277 when its author died as Pope John XXI. But Thomas himself speaks in the *Bonum universale de apibus*[4] of the *De natura rerum* as an earlier work of his, which seems decisive, and he is also credited with the authorship of both these works in the fourteenth century Dominican bibliography. A critical edition of the *De natura rerum* would be a valuable contribution to the study of medieval learning.

Life of Thomas.

The date of the birth of Thomas in Brabant has not been fixed but seems to lie between the years 1186 and 1210 and probably is close to the latter date. He attended the episcopal school at Liège for eleven years and entered the Dominican order in 1232. He states that he was in Paris in 1238 when William of Auvergne as bishop of that city called a meeting of all the masters in the chapter house of the Friars Preachers to consider the abuse of plurality of benefices.[5] In 1246 he became subprior and lector of the Dominicans at Louvain. Kaufmann placed the date of his death between 1263 and 1293, but if the date 1276 mentioned in his *Bonum universale de apibus* is correct,[6] he was alive then. In that work he seems to refer to Aquinas and Albertus Magnus as both still living,[7] but the former had already completed his studies with Albert and become a professor of theology himself,[1] while Albert is spoken of as if an old man.[2] Thomas says that he was an attendant upon his lectures "for a long while" when he occupied the chair of theology. It does not seem, however, that this passage implies any very close relation of discipleship between Thomas and Albert.

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[1] HL 30: 380.

[2] Sometimes the work concludes with the extraordinary *Explicit*, "the book of Lucius Annisius Seneca of Cordova, disciple of Fortinus the Stoic, *De naturis rerum*," as in Arundel 323.

[3] III, 16.

[4] In the preface.

[5] *Bonum universale de apibus*, I, 19, vii.

[6] *Ibid.*, II, 57, lix. At I, 5, ii, 1252 is given as the date of the "recent" murder of a Dominican by heretics at Verona; at II, 57, iii, great winds and thunders are mentioned, which frightened men in Germany nearly out of their wits in 1256.

[7] Aquinas died in 1274, Albert in 1280.

Character of the *De natura rerum.*

The *De natura rerum* is professedly a handy compilation made from numerous other writings, as Thomas states both in his preface and conclusion. Stimulated by the remark in Augustine's *Christian Doctrine* that it would be a splendid achievement if someone should collect in one volume data concerning the natures of things and especially of animals, Thomas has spared neither labor, solicitude, nor expense toward that end and has spent fourteen or fifteen years in collecting material "scattered widely over the world in the diverse writings" of many philosophers and authors. He has not been satisfied to pursue his investigations merely in Gaul and Germany, although books abound in those countries, but has gone beyond the sea and collected the books published in England on nature, and has made excerpts from all sources. He asks indulgence of his readers if he has omitted anything that should be included, reminding them how great a task it is for one man to read and digest all the varied and scattered works of the philosophers. Nevertheless he feels that "there will scarcely be found among the Latins so much and so varied material compressed into a single volume." [3] Thomas does not directly state as his aim, although it is perhaps involved in his citation of Augustine, the elucidation of the properties of things mentioned in the Bible, as we shall find that Bartholomew of England does. But he expresses a hope that arguments for the Faith and illustrations serviceable in sermons may be derived from his work, and there are a number of little books in existence in manuscript which seem to be extracts from the works of Thomas or Bartholomew intended for pulpit use.[1] Thomas will sometimes, moreover, like Alexander Neckam, explain the allegorical or moral significance of natural phenomena, "but not continually, because we have tried to avoid prolixity." As a matter of fact, it is rarely that he does so,[2] although the amount of allegory or moralizing varies somewhat in different manuscripts. These also differ as to the fulness of the text generally and there are numerous minor differences, certain passages being abbreviated or entirely omitted in some manuscripts. Copies have also been discovered of a second or revised edition in which a twentieth book has been added.[3]

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[1] *Bonum universale de apibus*, I, 20, xi.

[2] *Ibid.*, II, 57, li, "venerabilis ille frater ordinis predicatorum magister Albertus."

[3] From this statement one might infer either that Bartholomew's book was not yet published or that Thomas did not know of it.

Plan and contents.

The manuscripts also differ in their arrangement of the work, but as Thomas supplies us with a table of contents, there can be no doubt as to the original and correct order. He begins with the parts of the human body, devoting a chapter to each member, its ills and their cure, and having considerable to say on the subject of obstetrics. His second book discusses the soul (*anima*). The brief third book treats of strange and monstrous races of men who are found chiefly in the orient but in some cases elsewhere, hermaphrodites, for instance, in France. Then come successive books on quadrupeds, birds, marine monsters, fish, serpents, and worms. These six books devoted to animal life other than man occupy considerably more than half of the entire work. Thomas turns next to the vegetable kingdom, devoting two books to trees, of which the second deals with aromatic and medicinal trees, and one book to herbs. After the brief thirteenth book on fountains and other bodies of water he comes to (14) precious stones, (15) the seven metals, (16) the seven regions of air, (17) the sphere and planets, (18) meteorology, and finally to the universe and four elements.

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[1] HL 30: 384.

[2] As HL 30:374-5 has already noted.

[3] HL 30: 383 mentions three such MSS; see also CLM 6908, where, however, the three last books are missing; Lincoln College 57, 13th century; CU Trinity 1058, 13th century; Wolfenbüttel 4499, 14th century.

These two topics of his nineteenth book are usually discussed near the start of medieval scientific treatises, and the reason for the order adopted by Thomas is not very evident, unless perhaps he at first intended to write about animals alone and then added further books on other subjects, or unless he decided to begin with man the microcosm and end with the *mundus* or macrocosm. If such was his plan, he does not seem to say so, and it is hardly surprising that liberties were taken with his order in some of the manuscripts, which begin with book sixteen and end with book fifteen, apparently in order to start with the heavens and elements and then consider the particular creatures of inferior creation.

Chief authorities.

As the work of Thomas is professedly a compilation, it is important to note his authorities. At the start he mentions those to whom he is most indebted: first, Aristotle, and then Pliny. Third comes the *De mirabilibus* (instead of *memorabilibus*) *mundi* of Solinus whom Thomas esteems both as a man of marvelous eloquence and as a diligent scrutinizer of the natures of things. Very different this from Albertus Magnus' sceptical estimate of Solinus as a philosopher who told many lies, and yet there are modern scholars who contend that Albert took much of his natural science ready-made and without acknowledgment from the *De natura rerum* of his pupil [1] Thomas. It will be noted that Thomas names his chief authorities in chronological order. Fourth comes Ambrose, to whose eloquent description of birds and beasts in the *Hexaemeron* Thomas finds it necessary, however, to make additions; and fifth, Isidore. Sixth, and most recent in time, is the *Oriental History* of Jacques de Vitry to whom Thomas "was intimately devoted." [2] Jacques had occupied several chapters of his *Oriental History* [3] with the fountains, trees and herbs, animals, serpents, birds, and rare fish, precious stones and strange races of the orient, and had then added a briefer list to show that the west, too, was not without its marvels. Thomas also mentions two anonymous works, which he appears to cite chiefly concerning animals [1] and whose titles he gives as *Experimentator* and *Liber rerum*. Thomas was probably correct in his surmise that *Experimentator* had been compiled in recent times and we shall meet citations of it in other authors of the thirteenth century. But the original texts of the *Liber rerum* and *Experimentator* do not seem to have survived.

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[1] As has been said above, it is doubtful if there was any close relation of master and disciple between Albert and Thomas.

[2] HL 30: 377.

[3] Jacobus de Vitriaco, *libri duo . . . prior Orientalis . . . alter Occidentalis Historiae*, 1597, *Hist. Orient.* caps. 85-92.

Embodiment of long extracts.

Thomas mentions yet other authorities in his preface and even more in the course of his work. His method in using his sources varies. Sometimes he combines in one paragraph brief statements from a number of authorities bearing on the same topic. Again he may insert practically *verbatim* a long extract or complete treatment of a matter by some one author, or even an entire treatise such as the *Letter of Alexander to Aristotle* or Thetel's discussion of seals in stones. Thus in his first book on the human body he uses a work supposed to have been written by Cleopatra to her daughter on the subject of gynecology, and inserts in condensed form John of Spain's translation from the Arabic of the medical portion of *The Secret of Secrets* supposed to have been written by Aristotle to Alexander. His second book on the soul follows Augustine's treatise *De anima*. His third book on strange and monstrous races of men includes also some account of the Gymnosophists and Brahmans and their verbal repartee or epistolary correspondence with Alexander of Macedon.

Other citations.

With some of the authors whom he names Thomas was almost surely not directly acquainted. Dorotheus the Athenian, Menander, and Mago, for instance, he mentions as "authorities according to Pliny." He does not seem to make as much use of Galen as might be expected, were that author's works already accessible in Latin translation; but he probably had the old Latin version of Alexander Tralles, to whom he probably refers as *"Alexander medicus."* He probably also had seen Basil's *Hexaemeron* in Latin translation, since he cites it as well as Ambrose a number of times, and also in the preface to his *Bonum universale de apibus* lists "the great Basil" together with Aristotle, Solinus, Pliny, Ambrose, and Jacques de Vitry as his authorities in the discussion of bees in the *De natura rerum.* Many other writers he has without much doubt read for himself: Boethius, Martianus Capella, and Rabanus of earlier medieval Latin writers; Platearius and Constantinus Africanus in medicine; Aldhelme[1] and *Physiologus* on animals; of the Arabs Alfraganus, Albumasar, and perhaps Averroës. Michael Scot seems to be cited in some manuscripts and not in others.[2] In treating of stones Thomas does not cite Marbod by name but states that he is using the metrical version of the account which Evax, king of Arabia, is said to have written for the emperor Nero. Thomas, however, adds statements from other authors on stones. Like Alexander Neckam Thomas seems to use the *Natural Questions* of Adelard of Bath without acknowledgment. In discussing herbs he asks the three opening questions of Adelard's treatise and proceeds to solve them in words which are often identical. After this general introduction his chapters on particular herbs are almost invariably introduced by the formula, "As Platearius says." Ferckel has pointed out that the greater part of three chapters in his first book on human anatomy is drawn from the *Philosophia* of William of Conches,[3] and that the twentieth book, added in some manuscripts, is taken from the same work. Thus Thomas makes much use of comparatively recent authorities. He also tells us that he has not disdained to include some popular beliefs.

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[1] *Experimentator*, however, is also cited concerning the properties of air.

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[1] Thomas's extracts from Adhelmus were printed by Pitra (1855) III, 425-7. Concerning St. Aldhelm see above, chapter 27, page 636.

[2] Michael Scot is cited concerning silk-worms and gourds in Egerton 1984, fols. 100r and 121r, and, judging from the catalogue notice, also in Corpus Christi 221, but not in the corresponding passages in either Royal 12-E-XVII or 12-F-VI. The *Histoire Littéraire,* however, gives a citation of Michael's translation of Aristotle's *History of Animals* from three Paris MSS.

[3] Ferckel (1912), p. 4, "und tatsächlich ist fast das ganze Kapitel *De Impregnatione* ein Teil des folgenden und die erste grössere Hälfte des Kapitels 73 fast wörtlich der *Philosophia* des Wilhelm von Conches entnommen."

Credulous attitude.

Thomas of Cantimpré must be reckoned as one of the most credulous of our authors. In his books on animals he seems of the uncritical school of the marvelous of Solinus, Basil, Ambrose, the *Physiologus,* and Jacques de Vitry. Seldom does he question any statement that he finds in his authorities; indeed, he does not appear to possess the independent knowledge of animal life to enable him to do so. He does state that the power of the little *echinus* to stop ships has seemed incredible to many, but inasmuch as Ambrose, Jacques, Aristotle, Isidore, and Basil all assert it confidently, he does not see how there is any room left for doubt.[1] The story of the beaver's self-castration in order to escape its hunters is given without comment, and we are further told that the animal cannot live unless it keeps its tail in the water.[2] Thomas tells us that Isidore held that the Sirens were really harlots who enticed men to moral ruin, but he adds that the more general opinion is that they are irrational marine monsters who still exist and he cites "those who testify that they have seen the Sirens themselves." Their song is more like that of birds than it is like articulate speech. Sometimes, on the other hand, Thomas prefers a miraculous or supernatural to a natural explanation of a marvelous statement. He is not sure whether the onocentaur seen by St. Anthony in the desert was real or a deception of the devil, and he regards as not natural but a divine miracle the story that the Apostle Peter had shut up in a mountain near Rome a dragon which will live until the end of the world. He adds, however, the tale of the two dragons found alive under the tower from the *History of the Britons.* About all that can be said for

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[1] "Tanta fides in hoc auctorum est et tanta concordia ut nulli umquam de hoc dubitare relinquatur."

[2] In the condensed version of Egerton 1984 and Arundel 323 the castration story is omitted, but the other statement is made.

Thomas on this score is that he does not appear to add many new marvels of his own to the incredible assertions of past writers.

Very uncritical character of the *Bonum universale de apibus.*

Thomas's credulity seems to have increased with age, since his later *Bonum universale de apibus,*[1] in which bees are a mere starting point for a disquisition on the qualities which bishops and other clergy should possess and the introduction of innumerable anecdotes, is a tissue of monkish tales and gossip, instances of special providence, apparitions of the dead and of demons, and other miracles and moralities, most of which are supposed to have occurred in Thomas's own time and are recounted upon hearsay. Thus we read of a son who did not adequately support his aged father and was punished by a toad leaping onto his face and taking such a hold that it could not be removed but remained as a disfiguring growth. As a penance the son was sent by his bishop through the diocese as an example and warning to others. Or Thomas assures us that Albertus Magnus told him that at Paris the demon appeared to him in the form of a fellow friar in an effort to call him away from his studies, but departed by virtue of the sign of the cross. In short, the work is on the same order as the *Dialogues* of Gregory the Great.

A chapter on the lion.

Thomas's treatment of animals in general and quadrupeds in particular can perhaps best be illustrated by a paraphrase of some one chapter entire, for which purpose I have selected that on the lion. It will be noted that there is no apparent logic in the order of the statements which I have had to divide into paragraphs rather arbitrarily. It has seemed fairer, however, to reproduce the order unchanged than to bring together scattered statements bearing on the same point. Many of Thomas's statements are found also in Aristotle's *History of Animals,*[2] although Thomas's citations would indicate that some items, at least, were derived by him from that source only indirectly.

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[1] A fuller form of the title is: *Liber apum aut de apibus mysticis sive de proprietatibus apum seu universale bonum tractans de prelatis et subditis ubique sparsim exemplis notabilibus.*

[2] See especially *Historia animalium,* VI, 31; VIII, 5, IX, 44.

Different kinds of lions: their generation.

The lion, as Jacques and Solinus state, is called the king of animals. There are three kinds of lions. Many are short and have curly manes but are weak and cowardly. Those generated by pards are ignoble and degenerate and have no manes. The larger ones with ordinary manes are noble and keen and without guile or suspicion. The lion's brow and tail reveal his intentions. His virtue resides in his breast and forefoot and tail.[1] And he is stout-hearted.[2] He is so hot of nature that he is said to have sexual intercourse at all times.[3] The lioness bears first five, then four, then three, then two cubs, then only one, after which she becomes sterile.[4] Aristotle accounts for this by the great heat attending the generation of lions who have solider and stronger bodies for their size than other animals. The lioness has only two tits and not corresponding in size to her body. This is not because she has so few cubs but because she eats only flesh which does not readily turn into milk.

Disposition and behavior.

Solinus says that the lion is not easily enraged, but when anyone does provoke him he shows no mercy to his adversary. On the other hand, he spares the prostrate captive and allows those whom he meets by chance to proceed on their way.[5] He is fiercer to men than to women, and to women who have had intercourse with men than to virgins and children. Adelinus says that he sleeps with his eyes open. Pliny says that as he walks he obliterates his tracks with his tail in order to foil his hunters. Lions do not fight among themselves.[1] Solinus[2] says that if hunted in the open, the lion will wait for the dogs and dissimulate his fear, but in the woods, where no one can see his cowardice, will take to his heels. When pursuing his prey he leaps into the air in order to see farther, but not when he is fleeing. Aristotle states that the lion and Arabian camel are the only quadrupeds to move the right foot first. In making water the lion lifts his foot like a dog. When the lion opens his mouth a strong odor exudes. "The lion, very swift by fortitude, is somewhat heavy of nature because of its slow digestion." When running, it cannot come to a stop the instant it wishes.

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[1] In Egerton 1984 and Arundel 323 this statement occurs later and is ascribed to "Alexander". These MSS add that in its fore-quarters the lion is of a hot nature, in the hind-quarters cold, like the Sun in Leo.

[2] "Firmitas autem in pectore est."

[3] Egerton 1984, "to be feverish all the time."

[4] EB, 11th edition, "The number of cubs at a birth is from two to four, usually three."

[5] *Ibid.* "The lion . . . seldom attacks his prey openly, unless compelled by extreme hunger. . . . He appears . . . as a general rule only to kill when hungry or attacked, and not for the mere pleasure of killing, as with some other carnivorous animals."

Fear inspired and felt by lions.

When about to drink, the lion draws a wide circle with its tail and roars so that the other animals dare not cross this line.[3] Ambrose tells a marvel to the effect that many animals which are swift enough to evade the lion's onset are paralyzed by the sound of its roar. As king of beasts the lion scorns the society of the other animals and will not touch meat which is a day old.[4] But it fears a scorpion. According to the *Liber rerum,* some say that the lion is consumed internally by its own fury and fiery blood, even when it does not have the appearance of being angry. Solinus says that a lion in captivity fears the sound of wheels but dreads a fire still more. Jacques says that it is also afraid of a white cock. Pliny says that a captive lion can be tamed by seeing its cub whipped or by watching a dog obey a man.

Their diet, medicine, and mode of fighting.

Lions are never found overladen with fat. They take food or drink on alternate days, and fast if their digestion fails to operate. If they devour too much flesh, they put their claws into their mouths and extract it. The lion has a natural enmity for the wild ass. A sick lion eats an ape, as Ambrose says, or drains a dog's blood. Pliny tells of a Syracusan whom a lion persistently followed until he extracted a splinter from its foot. Another lion insisted on having a bone removed from its teeth. Some manuscripts[1] here insert from Pliny and Solinus the tale of the wiles of the lioness to conceal her amours with the pard, and the assertion that a lion wags its tail only when in good humor. When a lion begins to move it beats the ground with its tail but as it increases its speed lashes its back. When wounded it always takes note of the man who inflicted the wound and goes for him. If a man has hurled missiles at it but failed to hit it, the lion merely knocks him down. Philosopher says that when fighting for its cubs the lion keeps its gaze fixed on the ground so as not to be terrified by the spears of the hunters.

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[1] EB, "Though not strictly gregarious, lions appear to be sociable towards their own species."

[2] Also Aristotle, IX, 44.

[3] EB, 11th edition, "On no occasions are their voices to be heard in such perfection, or so intensely powerful, as when two or three troops of strange lions approach a fountain to drink at the same time."

[4] *Ibid.* "He, moreover, by no means limits himself to animals of his own killing, but, according to Selous, often prefers eating game that has been killed by man, even when not very fresh, to taking the trouble to catch an animal himself."

Medical virtues of the lion's carcass.

Pliny recommends eating the flesh and heart of a lion to persons afflicted with colds. The lion's bones are so hard that they strike fire like flint. The hollow in its bones is very small and rarely contains any marrow, and then only in the hip bones, as Experimenter[2] says. Lion's fat is an antidote for poisons, and a man anointed with it and wine puts to flight all beasts and snakes. It is hotter than the fat of any other quadruped. The lion is almost always feverish, and that with quartan fever. The effect of its roar upon other beasts is again mentioned. When crossing hard or stony ground the lion spares its claws since they are its weapons. Pliny asserts that lion fat with oil of roses keeps the face white and free from blotches. The neck bone of the lion is continuous and the flesh there cartilaginous like a muscle, so that it cannot turn its neck, a disability which some, the *Liber rerum* states, ascribe incorrectly to indignation or stolidity on the lion's part. Aristotle says that the internal organs and teeth of a lion are like those of a dog.

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[1] For instance, I found the passage in Royal 12-E-XVII, but not in Royal 12-F-VI.

[2] Aristotle, instead of *Experimentator*, in Egerton 1984 and Arundel 323. Of the small amount of marrow in lions' bones Aristotle treats twice, *Historia animalium* III, 7 and 20.

Medieval and modern encyclopedias compared.

After this account in the *De natura rerum* the article on the lion in the latest edition of the *Encyclopedia Britannica* will be found rather dull reading and scanty as concerns the behavior of lions as well as the medicinal properties of their carcasses. Almost all of antiquity's interesting assertions concerning lions are omitted, no doubt as false, but little of interest is supplied in their place. We are told a number of things that the lion will not do: he will not climb, he will not take more than three bounds after his prey. But even Thomas does not say that a lion ever climbs; the notion does not seem even to have occurred to him.[1] Nor does Thomas assert that all lions are brave or noble or magnanimous. On the whole, the lion does not seem a subject upon which modern science has added vastly to our knowledge. There were far more lions in existence in antiquity, and men were more interested in them then, and thought at least that they knew more about them.

Examples of the zoology of the Experimenter.

Some notion of the work ascribed by Thomas to *Experimentator* may be gained from Thomas's citations of it in his chapter on the wolf. Experimenter explains the fact stated by Ambrose, that a man who is seen first by a wolf cannot speak, by arguing that the rays from the wolf's eyes dry up the *spiritus* of human vision which in its turn dries up the human *spiritus* generally. Thereby the wind-pipes are dried up and in consequence the throat so that man cannot speak. Experimenter states further that the wolf collects willow leaves in his mouth and makes a pile of them under which he hides in order to catch goats. And when walking over dry leaves he licks his paws so that the dogs will not hear him. An insulting reflection upon the canine sense of smell!

Fish, worms, and toads.

We will pass over Thomas's books on birds, marine monsters, fish, and serpents, except to note in passing that Delisle credited him with supplying some new information concerning the medieval herring fisheries,[1] and come to his separate treatment of "worms." Those with only two or four feet have a little blood, but those with more feet than four are bloodless, because the blood is exhausted in providing nutrition for so many feet and because the motion of so many feet annihilates the blood. Many worms begin and end their life in the course of a summer, since they are born rather from corruption than from seed. Earthworms in particular are generated from pure and unadulterated earth with no admixture of *semen,* and so furnish illustration and proof of the virgin birth of Christ. In the opinion of the *Liber rerum* the toad is a worm. It is venomous and has a pestilential glance. It feeds on earth, eating as much as it can clutch in its forefoot, in which it is emblematic of avarice and cupidity. In Gaul there are big toads or frogs with a voice like a horn, but they lose their voice if taken outside of that country, typifying clergymen who like Jonah will not preach outside of their own land. Some manuscripts add from "Alexander" [2] that toads are fond of the plant salvia and that it is sometimes poisoned by contact with them. Hence it is advised to touch a patch of salvia with rue, the dew from which is deadly to toads. A stone found in the head of a toad, if worn by a man, is an amulet against poison. Several toads can be generated from the ashes of a toad.

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[1] I am told, however, that in a recent moving picture lions are seen climbing trees to escape from dogs.

Solomon's experiment in worms.

In planning to build a temple of fine marbles Solomon found embarrassing the prohibition in the Mosaic law forbidding one to cut stones for the altar of the Lord with iron. But then he sought by an experiment in worms what the art of man knew not. He shut up the fledglings of an ostrich in a glass vase, so that the mother bird could see them but could not get at them to feed them. The ostrich thereupon flew (?) off to the desert and came back with a worm. It then broke the glass vase by smearing it with the blood of this worm. Solomon found this worm, called *Thamur* or the worm of Solomon, equally efficacious in cutting marble.

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[1] HL 30: 367.

[2] Egerton 1984 and Arundel 323.

Trees.

In speaking of trees most manuscripts[1] tell of an oak under which Abraham dwelt and which lasted until Constantine's time. The trees in the Garden of Eden or terrestrial paradise are also discussed, though of course no longer accessible. Josephus is cited concerning trees near the Red Sea and apples of Sodom. Thomas thinks that the Sun-tree and Moon-tree mentioned in Alexander's letter to Aristotle had been referred to much earlier in the benediction of Joseph in *Deuteronomy*. As for the responses which these trees are said to have given Alexander, Thomas has little doubt that this was the work of demons, although some contend that it was done by divine permission through ministering angels.

Marvelous virtues of stones.

Like Marbod, Thomas points out that, while plants and fruits receive their virtues "through the medium of the operations of nature," no excess of cold or heat can be observed in stones to account for their miraculous powers, such as conferring invisibility, and that consequently their virtues must come direct from God. He alludes to the belief that Solomon imprisoned demons beneath the gems in rings, and cites the fifteenth book of *The City of God* for the statement that demons are attracted by various stones, herbs, woods, animals, and incantations.

An adamantine mariner's compass.

While Thomas's exposition of the virtues of gems is largely based upon Marbod, in discussing *adamas* or adamant he introduces a description of the mariner's compass, concerning which Marbod is silent and which had probably not been invented or introduced in western Europe that early, although Neckam of course alludes to it before Thomas. After speaking of a variety of adamant which can be broken without resort to goat's blood but which will attract iron even away from the magnet, Thomas adds that it also betrays the location of the star of the sea which is called *Maria*. When sailors cannot direct their course to port amid obscure mists, they take a needle and, after rubbing its point on adamant, fasten it transversely on a small stick or straw and place it in a vessel full of water. Then by carrying some adamant around the vessel they start the needle rotating. Then the stone is suddenly withdrawn and presently the point of the needle comes to rest pointing towards the star in question.[1]

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[1] Omitted in the two MSS mentioned in the preceding note.

The mariner's compass and magic.

Having concluded this description of a mariner's compass, Thomas again follows the poem of Marbod and goes on to say that the adamant is also said to be potent in magic arts, to make its bearer brave against the enemy, to repel vain dreams and poison, and to benefit lunatics and demoniacs. I mention this accidental juxtaposition of the mariner's compass and magic because, as we shall find in the case of Roger Bacon, it has often been stated that those in possession of the secret of the mariner's compass were long afraid to reveal it for fear of being suspected of magic, or that sailors were at first afraid to employ the new device for the same reason. This passage in the *De natura rerum* is as far as I know the only one in the sources that might even seem to suggest such a connection, but Thomas does not really connect the compass and magic at all. Later in the same book, in discussing the magnet, he says nothing of the compass, although repeating the usual statements that the magnet attracts iron, is used in magic, and has the occult property of revealing an unchaste wife.

Occult virtues of sculptured gems.

After completing his account of the occult virtues of gems in their natural state, Thomas goes on to discuss the sculpture of gems and the additional virtues which they thereby acquire, a subject on which Marbod had not touched. Thomas had already announced at the beginning of his book on stones:[2] "Moreover, at the close of this book we have given certain opinions of the ancients which we think are neither to be credited in every respect nor denied in every respect, and in this we follow the glorious Augustine. The children of Israel are said to have carved certain gems in the desert, especially carnelians, and their work of sculpture is said to have been of such subtle skill that no one since has ever dared attempt an imitation of it. And there is no doubt but that figures and images of figures are engraved according to the efficacies of the virtues of gems." Thomas also admits that the Israelites should have been adepts in such work, when he recalls the divine direction which they received in the case of the twelve gems in the breast-plate of the high priest. "Therefore it is evident that sculptures are not found on gems without good reason. On the other hand, I would not say that every such engraving is a token of mystic virtue." Later, when he comes to "the relations of the ancient sculptors concerning the engraving of gems," Thomas warns that, although the form of stones is to be honored for its virtue, "yet hope is not to be put in them but, according to what is written, in God alone from whom is derived the virtue of stones and the dignity of every creature." The astrological character of such engraved images is made manifest by the connection of many of them with the signs of the zodiac.

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[1] Compare the similar description of the *magnetized* needle in Neckam, *De naturis rerum*, II, 98 (RS 34: 183).

[2] HL 30: 370 does not mention this introductory passage but quotes a somewhat similar passage which occurs later on. In fact, Thomas makes practically the same statement at least three times in the course of his fourteenth book.

Thetel on images on stones.

Thomas complains that the ancient authorities for such images and their virtues are often not cited, but he had found a treatise in which the images which the children of Israel were supposed to have engraved in the desert were recorded by a Jewish philosopher named Thetel or Techel.[1] Of this treatise Thomas makes a Latin translation for his readers, cautioning them, however, that Thetel's opinions "are not to be trusted on every point." Thetel's treatise, at least as it is reproduced by Thomas who, however, has perhaps already used parts of it in his preceding discussion, begins with the sentence: "When a jasper is found and on it a man with a shield about his neck or in his hand and a serpent beneath his feet, this has virtue against all enemies." It ends with the sentence: "When there is found on a stone a foaming horse and above a man holding a scepter in his hand, this is good for those who have power over men." These sentences perhaps sufficiently suggest the character of the work. It is also found separately in the manuscripts as early as the twelfth century.[1] Some of these vary considerably from the text as given by Thomas. The popularity of the treatise is also attested by the allusions in its prefaces to spurious imitations of it.

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[1] *"Rechel"* in Royal 12-F-VI, fols. 106-7. Printed by Pitra (1855) III, 335-7, as "Cethel aut veterum Judaeorum Physiologorum de lapidibus sententiae."

Zahel or Zaël the Israelite.

This Thetel, Techel, or Cehel, with his seals of the children of Israel, is presumably no other than Zethel or Zachel or Zahel or Zaël, the Israelite or Ismaelite,[2] some of whose astrological treatises appeared in early printed editions,[3] and several of whose works are listed by Albertus Magnus in the *Speculum astronomiae.*[4] This Sahl ben Bisr ben Habib lived until 823 with the governor of Chorasan and then became the astrologer of El-Hasan, vizier to the Caliph al-Mamun. He was highly esteemed by the Byzantines, who called him Σέχελ or *τοῦ σοφωτάτου ’Ιουδαίου τοῦ* Σὰχλ *τοῦ υἱοῦ τοῦ Πέσρ.*[5] The translation of his works into Latin seems to have begun at an early date, as his *Fatidica* or *Decrees of Fate* was translated in 1138 by Hermann of Dalmatia,[6] while our treatise on seals appears in a twelfth century manuscript.

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[1] A further discussion of them will be found in Appendix II to this chapter.

[2] Steinschneider (1906) 54-5, 103-4, fails to include our treatise on seals in his mentions of Zaël's works; but in BN 16204, 13th century, the *Seals* of Theel is immediately preceded by two treatises of "Zehel the Israelite" on interrogations and elections.

[3] In the astrological miscellany of Petrus Liechtenstein, Basel, 1551, fols. 122-7, *Introductorium de principiis judiciorum;* 127-38, *De interrogationibus;* 138-41, *De electionibus;* 141-2, *De significatione temporis ad judicia.* Steinschneider mentions only the *Elections* as printed in 1551, but also notes a 1533 edition of it and 1493 and 1519 editions of all these treatises.

[4] In cap. 6, *Introductio,* "Scito quod signa sunt duodecim"; in cap. 9, *Judicia Arabum,* "Cum interrogatus fueris"; *De significatione temporis,* "Et scito quod tempore excitat motus"; in cap. 10, *Liber electionis,* "Omnes concordati sunt"; *Quinquaginta praeceptorum,* "Scito quod significata lunae."

[5] CCAG V, 3, 98-106.

[6] Steinschneider (1905), p. 34, names Hermann the Dalmatian as translator and notes CUL 2022, 15th century, fols. 102r-115v, Her-

Consecration of gems.

Thomas terminates his book on stones by instructions, quite in the tone of the blessed Hildegard, concerning the blessing of gems. As a result of Adam's fall every creature was corrupted and lost some of its original virtue, and even such virtues as are left to gems are often further corrupted by the touch of impious and impure men. Hence, just as sinful men are renovated by baptism and penance, so gems can have some of their lost virtues restored by a ceremony of consecration and sanctification. They should be wrapped in linen, placed on the altar, and the priest, after saying mass and while still wearing his sacred robes, should offer this prayer:

"God, almighty Father, who showed Thy virtue to all through certain insensible creatures, who bade Thy servant Moses adorn himself among other holy vestments with twelve precious stones as a token of judgment, and also showed the Evangelist John the heavenly city of Jerusalem eternally constructed of the virtues which these same stones typify, we humbly beseech Thy Majesty to deign to consecrate and sanctify these stones by the sanctification and invocation of Thy Name, that they may be sanctified and consecrated, and may recover the efficacious virtues with which the experience of wise men proves Thee to have endowed them, so that whatever persons may wear them, may feel Thy virtue present through them and may deserve to receive the gifts of Thy grace and the protection of Thy virtue, through Jesus, Thy Son, in whom all sanctification

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manni secundi translatio. "Explicit Fatidica Ben Bixir Caldei . . .," but the *Gi* in the *Explicit* of the following MS might stand for *Gerardi* and indicate Gerard of Cremona, who would, it is true, have been but twenty-four in 1138: Digby 114, 14th century, fols. 176-99, "Explicit fetidica Zael Banbinxeir Caldei. Translacio hec mam. Gi. astronomie libri anno Domini 1138, 3 kal. Octobris translatus (*sic*) est."

Some other MSS which Steinschneider does not mention are: Harleian 80; Sloane 2030, 12-13th century, fols. 41-76; Amplon. Quarto 361, 14th century, fols. 96-113, Chehelbenbis Israelite; and perhaps Sloane 3847, 17th century, fols. 101-12, Zebel alias Zoel, liber imaginum, but more probably this is the Pseudo-Zebel found in Berlin 965, 16th century, fols. 1-63, and printed at Prague, 1592, "Incipit zebelis sapientis arabum de interpretatione diversorum eventuum secundum lunam in 12 signis zodiaci."

consists, who lives with Thee, and reigns as God through infinite successions of cycles." [1]

The seven metals: modern plumbing.

In his book on the seven metals, namely, gold, electrum, silver, copper, lead, tin, and iron, Thomas alludes to transmutation in speaking of copper and cites a work of alchemy ascribed to Aristotle, *The Light of Lights (De lumine luminum)*, for the assertion that the best gold is that made from a boy's urine and brass. This statement is to be understood, however, only of the color of the gold and not of the substance. In his discussion of lead, tin, and iron Thomas cites no authorities except that once he remarks, "as the philosopher says." [2] Perhaps therefore we have here what is largely a contribution of his own. At any rate it seems to include the first mention of the invention of modern plumbing.[3] Tin, Thomas tells us, rusts out easily if it lies long in water. Therefore the underground pipes of aqueducts have long been made of lead, but they used to be joined with tin, but in "modern times" human art has thought out a method of uniting them with hot molten lead. For while tin will not remain solid for long, "lead lasts forever underground." Thomas goes on to say that lead has the peculiar property among the metals of always increasing in size. Like Hildegard, he also mentions steel, which he says is hardened by many tensions so that it surpasses iron in virtue. He further tells of an oriental iron [4] which is very good for cutting and is fusible like copper or silver but not ductile like the iron in other parts of the world.

The seven regions of the air.

The discussion in the *De natura rerum* of the seven regions of the air and their humors, namely, dew, snow, hail, rain, "laudanum," manna and honey, reminds one of Michael Scot's treatment of the same subject,[5] but seems to be drawn from a common source rather than directly copied from it. Thomas states that Aristotle has treated more fully of these humors in his *Meteorology,* but in reality Aristotle says nothing of the last three named in the *Meteorology,* although in the *History of Animals* he says that honey is distilled from the air by the stars. Thomas draws the same distinction as Michael Scot had made between natural honey and the artificial sort made by bees. He is willing to grant that the manna upon which the children of Israel lived was created in this region of the sky, although especially prepared for them by a divine miracle.

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[1] This consecration of gems also follows Techel's treatise on seals in Ashmole 1471, fol. 67v, while in Canon. Misc. 285 the work of Thetel is preceded at fol. 36v by *De consecratione lapidum*, and at fol. 38 by *De modo praecipuos quosdam lapides consecrandi.*

[2] Or, in one MS, "sicut dicunt phisici."

[3] This fact has already been noted by the HL.

[4] Called *andena* in one MS, and *alidea* in another.

[5] See above, chapter 51, page 324.

Astrological.

The astrological passages of the *De natura rerum* are neither striking nor novel. In his books on animals Thomas had stated that various animal substances such as the brains of wolves or the livers of mice vary in size with the waxing and waning of the moon. He denies that the planets possess sense or that their movements are voluntary, but he quotes Pliny's statement that by the influence of Venus all things on earth are generated, and states the influence of each planet when it is in the ascendant. Under Mars men become choleric and bellicose. Jupiter is such a source of safety and good health that Martianus declared that were Jupiter the only planet, men would be immortal. Such, however, was not the Creator's will. The word "Jupiter" is not without reason derived from *iubens* and *pater,* since during the ascension of this planet all terrestrial things are born. For unless seeds were severed from their beginnings by some occult virtue, they would always remain immovable in the state in which they were created. God accordingly put such power in the spheres of the stars and especially the planets that created things might obey his command to increase and multiply. They return, however, to the earth from which they came; the processes of nature are unceasingly repeated; and, as Solomon said, there is nothing new under the sun. Thomas therefore reaches the usual conclusion that except for human free will and special manifestations of divine will, all nature is placed by God under the rule of the stars. The influence of sun and moon is manifest, and "why should we not with entire reason believe the same of the other planets?"

Elements and spirits.

The nineteenth book opens with a discussion of the universe and creation and closes with a discussion of the four elements. Fire has eight effects expressed in the couplet:

Destruit, emollit, restringit, consolidatque;
Clarificat, terret, accendit, letificatque.

Thomas illustrates each of these effects by a verse of Scripture. Fire also has six properties, likewise expressed in a couplet:

Mobilis et siccus mundusque favilla tenetur;
Crescit et accendit[1] *sed aqua modica removetur.*

Concerning these properties also Thomas quotes Scripture. He then treats briefly of that purest fire which is above the seven regions of the air. Demons dwell in the air "awaiting with torments the judgment day."[2] When they appear to men, they assume bodies from that part of the air which is densest and most mixed with the other three elements. But angels coming as messengers to mankind assume bodies in the region of pure fire extending from the sphere of the moon to the firmament.

Other works incorrectly ascribed to Thomas of Cantimpré.

In the life of Albertus Magnus written by Peter of Prussia toward the end of the fifteenth century[3] it is stated on the authority of the chronicle of Brother Jacobus de Zuzato, master of theology, that Thomas of Cantimpré translated word for word from Greek into Latin "all the books of Aristotle in rational, natural, and moral philosophy and metaphysics which we now use in the schools,[4] and this at the instance of Saint Thomas of Aquinas, for in Albert's time all commonly used the old translation."[1] The task of translating Aristotle was scarcely one for which Thomas of Cantimpré was qualified, and his name almost never appears in the extant manuscripts of translations of Aristotle.[2] Peter of Prussia and his source have probably confused William of Moerbeke with Thomas of Cantimpré, as they both came from Brabant, and their names are juxtaposed in a fourteenth century list of writings by Dominicans, where, however, William is said to have "translated all the books of natural and moral philosophy from Greek into Latin at the instance of brother Thomas."[3] Because of Thomas of Cantimpré's chapters on gynecology, the *De secretis mulierum* usually ascribed to Albertus Magnus has sometimes been attributed to him, but Ferckel denies this.[4]

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[1] Or perhaps "ascendit."

[2] Compare Bede, *De natura rerum*, cap. 25.

[3] Petrus de Prussia, *Vita B. Alberti Magni*, (1621), p. 294.

[4] Trithemius, *De script, eccles* probably has Peter and Jacobus in mind when he states that some writers say that Thomas of Cantimpré knew Greek and translated the works of Aristotle used in the schools.

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[1] As Albert lived six years beyond Aquinas, this would indicate that his Aristotelian treatises were completed early in life. Yet some accuse him of using Thomas's *De natura rerum* in these works.

[2] Additional 17345, late 13th century, imperfect, ascribes the *antiqua translatio* of the fourteen books of Metaphysics to him, but is the only such MS I know of.

[3] One wonders if this can mean *Thomas Brabantinus,* whose name immediately follows that of *Wilhelmus Brabantinus* in the list, rather than Thomas Aquinas.

[4] Ferckel (1912), pp. 1-2, 10.

APPENDIX I

THE MANUSCRIPTS OF THE DE NATURA RERUM

Of the half dozen or so MSS which I have examined Egerton 1984, 13th century, fols. 34-145, and Arundel 323, 13th century, fols. 1-98, present a different version from the others, arranged in a different order and somewhat more condensed, although sometimes inserting points omitted in the other MSS, as has already been illustrated in the text in the reproduction of the chapter on the lion. These two MSS open with what is usually the 16th book on the seven regions of the air and continue with the subjects of the heavens and elements to which books 17-19 are usually devoted. Then, omitting the themes of the usual first three books, they consider quadrupeds (Egerton 1984, fol. 51v; Arundel 323, fol. 33r), other animals, and herbs. Then follow precious stones and metals, after instead of before which comes a truncated version of the book on fountains (Egerton 1984, fol. 142v; Arundel 323, fol. 91r). Next comes a treatment of parts of the human body which roughly answers to Thomas's first book but omits entirely the chapters dealing with generation and obstetrics. Indeed in Egerton 1984 the text breaks off at fol. 145v in the midst of the chapter on teeth and in the middle of a word, and then ends on the upper part of fol. 146r with the closing portion of the chapter *De anchis* and the chapter on *Spondilia.* Arundel 323 continues as far as the 44th chapter on the spleen. It then at fol. 98r introduces a brief discussion of geography (*Incipiunt Divisiones Provinciarum*), at the close of which we read, "Explicit liber lucii annisii Senece Cordubensis fortini stoyci discipuli De naturis rerum." The text, however, goes on to fol. 103v with a discussion of diseases, remedies, and astrological medicine. Neither this nor the list of provinces forms a part of the *De natura rerum* as contained in Royal 12-E-XVII and 12-F-VI.

As the *Histoire Littéraire de la France* listed only MSS of the *De natura rerum* at Paris and in a few other continental libraries, and as the authorship of Thomas of Cantimpré is seldom recognized in the MSS catalogues, I append a list of MSS in British and continental libraries which are not noted in the *Histoire Lit-*

téraire. No doubt the list is still very incomplete. C. Ferckel (1912), pp. 11-18 gives a fuller list than that in the *Histoire Littéraire,* but only those MSS which are marked with an asterisk in the following list have been noted by Ferckel:

British Museum

Egerton 1984, 13th century, described above.
Royal 12-E-XVII, 13th century.
Royal 12-F-VI, 14th century, fols. 3-119.
*Arundel 323, perhaps 13th century, described above.
*Arundel 142, 15th century, fols. 1-93.

The following contain only portions of the work:

*Arundel 298, perhaps 13th century, fols. 1-83, Books 3-9.
*Arundel 164, 15th century, fols. 5-58, preface and four books.
Sloane 2428, 13th century, 9 fols., Book 14 on gems.
Sloane 405, 15th century, fols. 65-107, "De natura rerum liber primus," attributed to Albertus Magnus but really the prologue of Thomas and most of his first book on anatomy.

At Oxford

Selden supra 75 (Bernard 3463), early 14th century, fols. 1r-231v, de naturis rerum secundum diversos philosophos. In 1919 the proof sheets for the new Summary Catalogue of Bodleian MSS still stated: "The author, who wrote while Jacobus de Vitriaco was bishop of Tusculum (1228-44: fol. 1v), appears to be unknown.".
*Canon. Misc. 356, 14th century, Anon. De naturis rerum.
Corpus Christi 221, 14th century, fol. 2-. Liber in quo tractatus de motu coeli, de elementis, de mari, de propriis mirabilibus cuiuslibet terrae, de lapidibus pretiosis, de metallis, de fructibus, de avibus, de bestiis, etc.
*Corpus Christi 274, 15th century, fol. 6-, Anon. de naturis rerum.
Lincoln College 57, 13th century, Anon. de proprietatibus rerum. This is the version in 20 books.

At Cambridge

Trinity 1058, 13th century, well-written, the version in 20 books, ending at fol. 186v.

James fails to rectify the attribution of the work to Albertus Magnus in both the following MSS:

Gonville and Caius 414, 13th century, fols. 1-161v.
Gonville and Caius 35, 15th century, fols. 1-137.

At Vienna

Vienna 2357, 14th century, fols. 1-46, Lucretius de naturis rerum.

Vienna 5371, 15th century, fols. 1-100r, Opus de rerum naturis.

At Munich

CLM 326, 14th century, 95 fols. The catalogue states, "Liber Thomae Cantipr. vel. Conradi Megenb. similis, sed multo amplior"; but its preceding description of the contents is sufficient to identify the work as Thomas of Cantimpré's.

CLM 2655, 13th century, fols. 1-94, de naturis rerum visibilium.

CLM 3206, 13-14th century, fols. 1-145, de naturis rerum liber.

CLM 6908, 13th century, fols. 1-78, Tractatus de naturis animalium in xx libros divisus quorum tres extremi desunt.

CLM 8439, 15th century, fols. 84-144, Alberti Magni de naturis rerum.

CLM 11481, anno 1390, de naturis rerum.

CLM 13582, 14th century, Thomae Cantipratensis liber de natura rerum.

CLM 14340, 15th century, Thomae de Catimprato de naturis seu proprietatibus rerum, in codice tributus Alberto Magno.

CLM 21008, 14th century, De proprietatibus rerum.

CLM 23879, 15th century, fols. 1-93, de natura rerum.

CLM 27006, anno 1409, fols. 1-170, de natura rerum.

Miscellaneous

*Wolfenbüttel 4499, 14th century, the version in 20 books, catalogued by Heinemann as anonymous.

Dôle 173-80, 15th century, fols. 1-189, "De secretis nature, Alberti Magni."

S. Marco XII-65, 15th century, ascribed to Albert, but opening, "Septem sunt regiones aeris, ut dicunt philosophi."

* Florence, Ashburnham 115, 15th century, "Expliciunt Capitula de naturis Lucii Anney Senece Cordubensis, Fortini Stoyci discipuli."

APPENDIX II

SOME MANUSCRIPTS OF THE TREATISE OF THETEL ON SEALS

For the Berlin MS I follow the catalogue description by V. Rose. I have examined personally the two Paris MSS and some of those at Oxford.

Berlin 956, 12th century, fol. 22, what Rose calls the "very peculiar original text." "Hic incipit liber sigillorum filiorum israel quem fecerunt in deserto. Cum pluribus libris nobilibus magne auctoritatis et nominis vigilante animo atque perspicaci, fratres karissimi, studeamus," etc., which may be translated: "Here begins the books of seals of the children of Israel which they made in the desert. Although, dearest brothers, we have studied many noble books of great authority and name with vigilant and perspicacious mind, we have not found any book so dear and precious as this is. For this is that great and secret precious book of seals of Cehel the Israelite, which the children of Israel made in the desert after their exodus from Egypt according to the course and motion of the stars. And because many false books are made in imitation of this, in order that we may perfectly know the virtue of these seals we have noted them down in this little book."

BN 8454, 12-13th century, fols. 65v-66r, Liber magnus et secretus sigillorum Cehel. The *Incipit* and text closely resemble Digby 79, except that the name is spelled "Cehel" and that no mention is made of the planets.

BN 16204, 13th century, pp. 500-7. Has the same *Incipit* as BN 8454 and Digby 79, except that the name is spelled "Theel" and that the last clause of the *Incipit,* "et quia multi . . . subnotavimus" (for which see the description of Digby 79 below) is omitted. On the other hand, we have the following opening paragraph of text which is not found in BN 8454: "I, Theel, one of the sons of the children of Israel, who after the transit of the Red Sea ate manna in the wilderness and drank water from the rock and saw innumerable miracles with my own eyes, and heard why from the twelve tribes twelve precious stones are worn by order of the Lord on Aaron's vestments. And I myself chose them. And besides this selection I have inspected the engraving of gems made, as the divine Nature willed, according to the movement of the signs and the courses of the planets. And I have learned the virtues of many. And I am called Theel (or rather, Cheel) for this reason, because I have written of sealing (*de celatione*), that is, concerning the sculpture of gems, and not because I have concealed and kept to myself what God and nature have produced, for I write to you, my posterity, in order that through these few brief words many seals may be known in the nature of stones."

This MS then has at pp. 500-2 the same text as BN 8454 except that the names of the planets are inserted before the first seven seals. At p. 502 the text as given in BN 8454 ends with the words, "Hoc autem sigillum fertur habuisse galienus," but the listing of seals continues in BN 16204 until the top of p. 507, where the work of Haly on elections begins.

Digby 79, 13th century, fols. 178v-180, opens, "In nomine Domini nostri Jesu Christi. Hic est liber preciosus magnus atque secretus sigillorum Eethel quem fecerunt filii Israel in deserto post exitum ab Egipto secundum motus et cursus siderum, et quia multi ad similitudinem huius falso facti sunt, in hoc libello subnotavimus." This version differs from that of Thomas of Cantimpré, since its first seal is made under the planet Mercury and is an image of a man seated on a plow. Then "under Mars" comes a fuller description of what is the first seal in Thomas's version.

Digby 193, 14th century, fol. 30, closely resembles Digby 79, except that the name is spelled "Cethel."

Ashmole 1471, late 14th century, fols. 65v-67v, closely resembles Thomas of Cantimpré's text. "Incipit liber Techel. Liber Techel nomine editus de sculpturis lapidum a filiis Israel eo tempore quo per desertum transierunt, et transierunt ut intrarent terram promissionis: propterea hii lapides leguntur fuisse assignati in templo Appollonis a rege Persarum cum consilio omnium astrologorum tam Egiptiorum quam Caldeorum secundum cursum signorum et cursum planetarum." Next ensue the same preliminary observations that Thomas makes; the text of Techel proper begins only at fol. 66v.

Canon. Misc. 285, 15th century, fol. 40, anon., "In nomine dei Amen; Pretiosissimus liber sigillorum quem filii Israel post exitum. . . ."

Corpus Christi 221, 14th century, fol. 55.

Selden 3464 (Bernard), ♯ 9.

CUL 1391, 14th century, fols. 204v-207v, "Liber magnus de sigillis lapidum et de virtutibus eorum quem fecerunt Filii Israelis in Deserto." Like BN 8454 it closes, "hoc sigillum fertur habuisse Gallienus."

CHAPTER LIV

BARTHOLOMEW OF ENGLAND

Bartholomew on the character of his book—Question of its date—Who are the most recent authors cited in it?—How far are its citations first-hand?—Its medieval currency—Not a mere compilation nor limited to Biblical topics—The nature of demons—Psychology and physiology—Vision and perspective—Medieval domestic science—The medieval domestic servant—Medieval boys—Medieval girls—A medieval dinner—Dreams and their interpretation—Medical advice—Poisons—The waters above the firmament—The empyrean heaven: Rabanus—Alexander of Hales—Aristotelian theory of one heaven—As the basis of astrology—Properties and effects of the signs and planets—Bartholomew illustrates the general medieval acceptance of astrology—Medieval divisions of the day and hour—Form and matter; fire and coal—Air and its creatures—The swallow, swallow-stone, and swallow-wort—The hoopoe and magic—Water and fish—Jorath on whales—Geography; physical and political—Also economic—Medieval boundaries—France in the thirteenth century—Brittany and the British Isles—A geography by Herodotus—Two passages about magic—Bartholomew and Arnold of Saxony on stones—Citations by Arnold of Saxony and Bartholomew—Virtues of animals—*Physiologus*—Color, odor, savor, liquor.

Bartholomew on the character of his book.

On the Properties of Things by Bartholomew of England [1] is, as has been said in a previous chapter, a work of the same sort as those on the natures of things by his earlier

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[1] Bartholomew has already been presented in part to English-speaking readers in Steele's *Medieval Lore*, London, 1907, and more recently in excerpts in Coulton's *Social Life in Britain from the Norman Conquest to the Reformation*, Cambridge, 1918, but their quotations and most other modern references to him are based upon the later medieval English versions of his work and not upon his own original Latin text. My summary is based directly upon the Latin text as printed by Lindelbach at Heidelberg in 1488: *"Explicit liber de proprietatibus rerum editus a fratre Bartholomeo anglico ordinis fratrum minorum. Anno domini Mccccixxxviii kalendas vero Junii xii."*

I am indebted to the liberality of the John Crerar Library in Chicago in allowing this rare volume to be transported to Cleveland for my use.

I have also checked up the printed text to some extent by examination of the following MSS at Paris. On the whole the discrepancies between the MSS and printed version seem slight, al-fellow-countryman, Alexander of Neckam, and his contemporary of Brabant, Thomas of Cantimpré. Bartholomew himself clearly states the character, purpose, and scope of his work both at its beginning and again in closing. It is primarily a brief compilation of passages on the natures and properties of things, which are scattered through the works both of the saints and the philosophers, with the intent of making plainer the enigmas which the Holy Scriptures conceal under the symbols and figures of the properties of natural and artificial objects. Bartholomew further speaks modestly of his work as an elementary treatise, textbook, or work of reference for the benefit of "young scholars and the general reader (*simplices et parvuli*) who because of the infinite number of books cannot look up the properties of the objects of which Scripture treats, nor are they able to find quickly even a superficial treatment of what they are after."[1] Bartholomew's book is therefore "a simple and rude" compilation, but he hopes that it may prove useful to persons who, like himself, are not advanced scholars. But after mastering this elementary treatise, they should proceed to more subtle and specialized works. And if they think that anything should be added to what he has given, let them add it. From the tone of these remarks compared to those of Thomas of Cantimpré one would infer that the number of available books and also the amount of available knowledge had considerably increased since Thomas wrote. Yet at the most Bartholomew cannot have written very many years later than Thomas, and it is most likely that their books appeared almost simultaneously.

Question of its date.

If Bartholomew's last sentence is interpreted as an open invitation to his readers to issue revised editions of the book or at least add to their own copies further extracts

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though a modern critical edition of Bartholomew's work is certainly desirable, especially in view of the rarity of the *editio princeps*.

BN 16098, 13th century.
BN 16099, 13th century.
BN 347, 14th century.

Since I finished this chapter a paper has appeared by G. E. Se Boyar, "Bartholomaeus Anglicus and his Encyclopaedia," in *The Journal of English and Germanic Philology*, XIX (1920) 168-89.

[1] *De propriet. rerum*, Book XIX, close.

from the writings of the saints and the philosophers, we shall feel that it is rather risky to attempt to determine the date of the first appearance of the *De proprietatibus rerum* from the date of the latest works cited in our present copies. But all the manuscripts seem to be essentially alike regardless of date, and the printed edition seems to vary little from the text of the earliest manuscripts. To assist us in determining when Bartholomew lived and wrote we have a request from the General of the Franciscan Order in 1230 asking the French provincial to send to Magdeburg in Saxony Brother Bartholomaeus Anglicus to act as lecturer there.[1] Salimbene, writing in 1284, cites a passage from Bartholomew concerning elephants and looks back upon him as a great clerk who lectured on the whole Bible in course at Paris.[2] Bartholomew speaks of the inhabitants of Livonia as having been forced by the Germans from the cult of demons to the Faith of one God, and states that by divine grace and the cooperation of the Germans they are now believed to be freed from their former errors.[3] But since the conquest of Livonia began as early as 1202, this passage does not serve to date Bartholomew's work very definitely.

Who are the most recent authors cited in it?

It has already been remarked by the *Histoire Littéraire de la France* that in the bibliography at the close of his work Bartholomew mentions no writer of later date than the early thirteenth century.[4] As Bartholomew himself states, however, he uses "many other" authorities than those given in the list, and other names are found sprinkled through his text. In the printed edition of 1488 the *Speculum naturale* of Vincent of Beauvais, which was not written until 1250, is cited,[5] but this mention is found in the last sentence of a chapter and may be pretty certainly regarded as a later interpolation.[1] In citing commentaries upon the works of Aristotle the printed text confuses the abbreviations *Albu., Alber.,* and *Alfre.* or *Alur.,* standing respectively for Albumasar, Albertus Magnus, and Aluredus or Alfred of England who alone is listed in Bartholomew's bibliography. There seems to be no certain citation of Albert. If Bartholomew had read Albert's sharp criticism of Jorath, he perhaps would not have made use of that author. The bibliography includes the names of Michael Scot who was dead by 1235 and of Robert of Lincoln, by whom Grosseteste must be meant, who was born about 1175, became bishop of Lincoln in 1235, and died in 1253. A Gilbertus mentioned in the bibliography may be either the medical writer, Gilbert of England, whose own date is somewhat uncertain, or a corruption for Gerbert. These three writers are seldom, if ever, cited by name in the text of Bartholomew. But he does cite Alexander of Hales[2] who died in 1245. On the whole it seems possible that Bartholomew wrote his work as early as 1230.

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[1] Wadding, *Annales*, 1230, No. 16; cited HL XXX, 355.

[2] Cited HL XXX, 354.

[3] *De propriet. rerum*, XV, 88.

[4] HL XXX, 357; at pp. 356-7 it reproduces Bartholomew's bibliography.

[5] IV, 2, "Hec vincentius in speculo suo naturali, li. III, ca. lxxiii." I was not able to find this citation in such MSS as I examined.

How far are its citations first-hand?

The *Histoire Littéraire* asserts that "Bartholomew surely was not acquainted with all the authors, true or supposititious, whom he is pleased to enumerate," but it gives no grounds except the list itself for this sceptical attitude. It is true that in the case of a few authorities in his list, such as Scipio Africanus, Ninus Delphicus, and Epicurus, it would have been as difficult to find any works by them then as now. But I believe that Bartholomew was a wide reader and acquainted with the greater part of the books and authors that he cites. Modern writers concerning medieval learning have too often proceeded upon the gratuitous assumption that medieval writers seldom were directly acquainted with the authorities which they cite. But one suspects that those who have assumed this were none too well acquainted themselves either with the works citing or cited. And why should medieval scholars take their citations at second hand? The original works were fairly accessible; the earliest manuscripts we have of them are almost invariably medieval, and probably they had many, many more copies that are now destroyed, and possibly some originals that are now forever lost. As for Bartholomew, his citations are so numerous, so varied, so specific that they must be largely first-hand.[1] Obviously he did not spare himself trouble in making a book to save others trouble. Bartholomew also seems to be scrupulously honest in his citations. For instance, Pythagoras is cited but once in the *Etymologies* of Isidore,[2] and when Bartholomew makes use of this passage, he gives both Pythagoras and Isidore credit.[3] It is therefore only fair to Bartholomew to admit that, had his citations of Pythagoras in *The Book of the Romans* been drawn from any third author, he would have given him credit too. Bartholomew cites Pliny's *Natural History* by book and chapter and is evidently directly acquainted with it. On the whole, I am inclined to think that medieval writers had read quite as much of the works listed in their bibliographies as modern writers have of those listed in *theirs*.

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[1] Had the *Speculum naturale* been written before the *De proprietatibus rerum,* Bartholomew, if he cited it at all, would have made use of it more than once, but would hardly have spoken as he did of the need of one compilation on the natures and properties of things, had the *Speculum* already been in existence.

[2] VIII, 3.

Its medieval currency.

In the Bibliothèque Nationale at Paris alone there are eighteen manuscripts of the *De proprietatibus rerum*, chiefly of the late thirteenth and early fourteenth century, and the *Histoire Littéraire* tells us that its title appears in a catalogue of the books which the medieval booksellers of Paris rented to the students at that university.[4] The work also occurs with frequency in the manuscript collections of England, Germany, and Italy. Hain's list of fourteen printed editions of it before 1500 is incomplete, and the British Museum catalogue of books printed in Germany alone in the fifteenth century mentions nine editions. It was translated into French under Charles V in the fourteenth century, and also appeared in English, Spanish, and Dutch versions, all three of which were printed at the end of the fifteenth century. These facts indicate that the work was, and continued until the sixteenth century to be, widely used as a text-book, and suggest the further thought that such widely multiplied and disseminated elementary and popular works are more likely to have survived the stagnant and destructive period of the Black Death and Hundred Years War and to have come down to us than are the more advanced, original, and elaborate works of the thirteenth century. Be that as it may, we must not look upon the *De proprietatibus rerum* as a specimen of the most advanced medieval scholarship, but rather as an illustration of the rough general knowledge which every person with any pretense to culture was then supposed to possess. At the same time, the large number of authorities cited shows how much wider reading a medieval student might do.

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[1] It is true that they do not always seem absolutely accurate, but copyists may have altered or misplaced them.

[2] *Etymol.*, XII, 4.

[3] *De propriet. rerum*, XVIII, 8.

[4] HL XXX, 363.

Not a mere compilation nor limited to Biblical topics.

On the other hand, we must not be misled by Bartholomew's humble tone of self-depreciation nor even by his assertion, repeated at the close as well as the opening of his work, that he presents "little or nothing of my own, but simply the words of the saints and the sayings of the philosophers." As a matter of fact, he not infrequently alludes to contemporary matters or describes daily life without mentioning any authorities, and his amusing accounts of such animals as cats and dogs, or boys and girls, or his instructions how to set a table and give a dinner, are almost entirely his own and show considerable power of observation and dry humor. His chapters on geography, too, deal in large measure and with unusual fulness with the feudal states and peoples of his own day: Scotland, Ireland, Flanders, Brabant, Anjou, Poitou, and so on through a long list alphabetically arranged. In these and in other chapters he forgets all about the fact that he is supposedly explaining only those things mentioned in the Bible, and is manifestly actuated by a scientific interest in present facts and phenomena. The influence of Isidore's *Etymologies* upon Bartholomew's book is evident, and Bartholomew often makes Isidore his starting point in discussing a given topic. But he also often goes far beyond the other's brief statements; it seems clear that the scanty contents of the *Etymologies* are no longer deemed sufficient even in an elementary encylopedia and general text-book. Bartholomew seems to use the scissors less than Thomas of Cantimpré, to state things more in his own words, and not to make such long extracts from or paraphrases of other works.

However, in Bartholomew's first book, whose subject is God, the first two chapters are taken entirely and perhaps discreetly, since the difficult problem of the Trinity is under discussion, from an *Extra* of Innocent III, while the third chapter is drawn from more varied authorities, such as Augustine, the treatise on the Trinity ascribed to Boethius,[1] and the more recent Hugh and Richard, both of St. Victor. Presently the theme of divine names is discussed [2] and Bartholomew lists and explains the ten Hebrew names of God, which are found also in Isidore, namely: El, Eloe, Sabbaoth, Zelioz or Ramathel, Eyel, Adonay, Ya, Tetragrammaton, Saday, and Eloym.

The nature of demons.

In the second book on the properties of angels is also discussed the nature of demons.[3] They are naturally perspicacious in matters of science and powerful by their "sense of nature"—a phrase which we have already met in William of Auvergne, whom, however, I think Bartholomew does not cite; perhaps it was a technical expression that spread rapidly from mouth to mouth of medieval psychologists as such expressions do today,—experience of time, and knowledge of Scripture. They can predict many future events, partly because their knowledge of nature gained through their subtler senses is superior to man's, partly because of their longer lives which permit them to learn more, partly by angelic revelation. Their bodies were celestial before they transgressed but now are aerial. Apuleius's characterization of them is repeated *via* Augustine, whose explanation is also given, that they know occult virtues in nature which are hidden from us and by which they are able to accelerate natural processes and work feats of magic such as those performed by Pharaoh's magicians.

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[1] And now again accepted as his; see above, chapter 27, page 619.

[2] *De propriet. rerum,* I, 19.

[3] *Ibid.,* II, 19-20.

Psychology and physiology.

Bartholomew's third book may be described as psychological and discusses the human mind or soul (*anima*), of which definitions by various Greek philosophers are repeated, and the senses. The fourth and fifth books are physiological. These three books seem to be based mainly upon the writings of Constantinus Africanus; less frequently Aristotle and other authorities are cited. One treatise is ascribed to Avicenna and Constantinus which is not in Peter the Deacon's list of the latter's works, namely, a treatise on poisonous animals and poisons and presumably a translation of Avicenna by Constantinus.[1] In this connection we are told that while some animals have poisonous tongues like snakes, others have medicinal and healing tongues like the dog, as Cassiodorus says, and either from the goodness of nature or from some occult property.[2] We have already noted elsewhere Bartholomew's acceptance of the usual medieval theory of three brain cells devoted to three mental faculties, in which connection he cites Johannitius or Hunain ibn Ishak.[3] In discussing the disease of *melancholia* Bartholomew tells of a noble whom he knew who imagined that he was a cat and insisted upon sleeping under the bed in order to watch the mouse holes.[4] In a later passage in his seventh book Bartholomew repeats Constantinus' distinction between mania as an infection of the anterior cell of the brain with injury to the imagination and melancholia as an infection of the central cell with loss of one's reason.[5]

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[1] *De propriet. rerum,* V, 21-22. (Henceforth all citations in this chapter, unless otherwise noted, will be to this work.) BN 16099, fol. 31r, V. 21, "ut dicunt avicenna et constantinus in tractatu de venenosis animalibus et venenis"; V. 22, "ut dicunt predicti auctores in tractatu de venenis."

[2] V, 21.

[3] III, 10 and 16; V, 3.

[4] IV, 11.

[5] VII, 5.

Vision and perspective.

In discussing vision Bartholomew gives the views of "an author of the science of perspective" precedence over those of Constantinus.[1] This author believes that in vision three coterminous pyramids or cones are formed with the apex of each in the pupil of the eye and the base formed by the object seen. One pyramid is made up of *species* from the object coming along straight lines to the center of the eye. The second pyramid is made by the vision going out from the eye to the object seen. The third pyramid consists of light, which, as Bartholomew explains elsewhere[2] on the authority of Basel and Dionysius and Augustine, is a distinct substance by which other bodies are illuminated. Light was created three days before sun and moon which are simply vehicles for it. But while this light is always shining, whether visibly or invisibly, it produces illumination only when other bodies are in a condition to receive it. The human eye can see itself only by the reflection of rays, "and possibly the vision delights in the sight of a mirror because through reflection of rays it is, by returning to itself, fortified as it were and in a way strengthened."[3]

Medieval domestic science.

Bartholomew's sixth book is entitled, "Of ages," but really deals more with matters of daily family and domestic life, discussing in addition to age, death, infancy, childhood, manhood, such family relationships as father, mother, and daughter, and such domestic concerns as servants, food and drink, dinners and banquets, sleep and waking, dreams and exercise. This last topic of exercise is discussed largely in the words of a sermon by Fulgentius, but in other chapters Bartholomew writes so vividly from his own observation that he deserves quotation, although the themes are somewhat of a digression from our main subject.[4]

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[1] III, 17.

[2] VIII, 40.

[3] V, 7.

[4] Since I completed this chapter in manuscript form there has appeared in print G. C. Coulton's *Social Life in Britain from the Conquest to the Reformation*, Cambridge, 1918, in which he has selected almost exactly the same passages from Bartholomew as illustrations of his theme. This is welcome confirmation of their interest and importance, and I have decided to let the following paragraphs stand for two reasons, despite the fact that they are now available elsewhere in

The medieval domestic servant.

"The handmaid is a female slave deputed to make herself useful to the housewife. She is assigned to the more laborious and demeaning tasks, she is fed with coarser food, she is clad in meaner clothing, she is oppressed by the yoke of servitude." Her son becomes a serf and, if she is of servile condition, so does a freeman who marries her, nor is she permitted to marry as she chooses. "Like the serf, she is because of the vice of ingratitude recalled after being manumitted, is afflicted with scoldings, is bruised by rods and beatings, is oppressed by varied and conflicting vexations and anxieties, is scarcely permitted to breathe amid her miseries." Such painting of her woes does not imply much sympathy on Bartholomew's part, however, since he concludes by saying that it is written that whoso nourishes his servant delicately will find him insolent in the end.[1]

Medieval boys.

Boys have a great capacity for mischief but are susceptible to discipline, if put under tutors and compelled to submit to it. Their constitutions are hot and moist, their flesh is soft, their bodies are flexible, agile, and light; their minds are docile. They lead a safe life without care and worry, appreciating only play, fearing no danger more than the rod, loving apples better than gold. They go naked unashamed; they are heedless of praise or scolding, easily angered and easily placated, easily hurt in the body and unable to endure much work. The hot humor that dominates them makes them restless and fickle. They tend to eat too much and are susceptible to various diseases in consequence. They think only of the present and care nothing for the future; they love games and vanities but refuse to attend to gain and utility. "The least things they

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English. In the first place any description of the *De proprietatibus rerum* would seem rather incomplete without them. In the second place Mr. Coulton gives the passages in Trevisa's English translation, while I have made a translation direct from the Latin text in more modern English. The exaggerated impression of quaintness and illiteracy which the old English version makes upon the modern reader finds in my opinion little or no justification in the original Latin. Men apparently could think more directly in Latin in the thirteenth century than they could express themselves in English in the fourteenth or fifteenth century.

[1] VI, 11.

think the greatest, and vice versa." "They want what is hurtful and contrary to them." They do not remember favors received. All that they see they desire and imitate. They prefer to talk with and take advice from other boys, and shun the company of their elders. They can't keep secrets. They laugh or cry easily, and they are continually shouting, talking, or chattering, and can scarcely keep still even while they are asleep.[1]

Medieval girls.

Girls "are in constitution hot, moist, and of delicate health; in physique graceful and flexible and beautiful; in mental attitude modest and timid and playful; in their social relations well trained in manners, cautious and reticent in speech, luxurious in dress." After quoting Aristotle to the effect that women generally have longer and softer hair than men and a longer neck, and remarking the peculiarities of their complexions and figures, Bartholomew says further that they have slenderer and more flexible hands and feet, a weaker voice, voluble and ready speech, that they take short steps, and that in mind they tend to be haughty, are prone to wrath, tenacious in hate, merciful, jealous, impatient of labor, docile, tricky, bitter, and "headlong in lust."[2] Whether Bartholomew is inconsistent in this passage or believes that the female nature is, the reader must judge.

A medieval dinner.

These are Bartholomew's instructions for giving a dinner party: "First the food is prepared; at the same time the guests are assembled; chairs and also stools are required; in the dining room tables are set and the table furnishings are arranged and adorned. The guests with the host are placed at the head table, but they do not sit down at table before the hands of the guests are washed; next the host's children and then the servants are grouped together at table. Spoons, knives, and salt cellars are first placed upon the table. Loaves of bread and cups of wine are presently added. There follow many and varied courses; the butlers and waiters serve each person diligently. The guests joyfully engage in vying with one another in pledging toasts; they are cheered with viols and citharas; now the wines and now the courses are renewed; they divide and share with one another the dishes which happen to be opposite them; finally the fruit and dessert are brought in. When dinner is finished, the table furnishings and remains of food are carried away and the tables are set aside. Hands are again washed and wiped; thanks are returned to God and to the host; for the sake of good cheer the cups go round again and again. When these features of the dinner are over, the guests either are offered couches for some rest, or are allowed to return home." [1]

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[1] VI, 5.

[2] VI, 6.

Dreams and their interpretation.

In a chapter on dreams Bartholomew declares that they are sometimes true and sometimes false. One should neither put indiscriminate faith in them nor spurn them entirely, since sometimes certain conjectures concerning the future may be had through dreams. Moreover, the meaning of some dreams is evident at once; others require interpretation. Dreams arise from varied sources, being produced by divine inspiration, by angelic administration, by diabolic illusion, or by natural and bodily causes.[2]

Medical advice.

Bartholomew's seventh book is medical, treating of infirmities in seventy chapters. His desire to be brief is probably what restrains him from including any long medical concoctions. He continues to make much use of Constantinus Africanus, who is cited in almost every chapter, and whose "many other experiments" [3] Bartholomew often has not time to include. One of the cures cited from Constantinus is to scarify the shin bones in order to cure a headache, the theory being that this will remove the injurious humor from the head to the lower extremities.[4] A part of the treatment prescribed for cases of frenzy is to shave the scalp and wash it with tepid vinegar or cover it with plasters made of the lung of a pig or cow. Keeping the patient firmly bound in a dark place, bleeding him, and abstaining from answering his foolish questions are other features of the regimen suggested.[5] To rouse a patient from a state of stupor and lethargy it is recommended to pull hard at his hair or beard, dash cold water frequently in his face, or make a stench under him.[1] An "experiment" against epilepsy from Platearius consists in scarifying three drops of blood from the patient's scalp and at the end of the fit giving them to him to eat with a crow's egg.[2] Indeed crow's eggs alone are regarded as quite beneficial. To Platearius is also credited the following method "of curing or at least palliating leprosy."[3] Take a red snake with a white belly, remove the venom, cut off the head and tail, cook it with leeks, and administer it frequently with food,—a preparation roughly similar to theriac. Wine in which a snake has lain putrefying a long time is "a medicine useful for many diseases," and Bartholomew repeats the tale we have heard before of the woman who caused her blind husband to recover his sight instead of killing him when she cooked a snake instead of an eel with garlic for him to eat. After such liberties had been taken with his blindness, one would expect a husband to recover his sight, if he could!

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[1] VI, 22.

[2] VI, 27.

[3] VII, 9 and 16.

[4] VII, 2.

[5] VII, 4.

Poisons.

The poisons of venomous animals differ. The venom of the viper is hot and dry; that of the scorpion, cold and dry; that of the spider, cold and moist. Avicenna says that the poison of the male is really more deadly than that of the female, but female serpents have more teeth and so are perhaps worse on the whole. The venom of the old is more injurious than that of the young; that of a fasting animal is more harmful than that of a full animal; and poisons are worse in summer than winter, and at noon than at night.[4] "Diascorides" says [5] that river crabs possess an occult virtue against the bite of mad dogs, and their ashes taken with gentian are a singular remedy. A scorpion sting may be cured by placing oil in which the scorpion has been drowned or boiled upon the puncture, or by pulverizing the scorpion's body and placing it upon the wound. The idea of course is that the poison will return to the body from which it came.

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[1] VII, 6.
[2] VII, 9.
[3] VII, 64.
[4] VII, 66.
[5] VII, 68.

The waters above the firmament.

In book eight Bartholomew discusses the universe and celestial bodies. According to the tradition of the saints there is a visible and an invisible heaven. The visible heaven is multiplex and subdivides into seven heavens, the aerial, ethereal, fiery, Olympian, the firmament, the aqueous or crystalline, and the empyrean. The authority of Scripture concerning the waters above the firmament causes Bartholomew to accept the existence of an aqueous or crystalline heaven. But he rejects Bede's view that these waters are cold and congealed in order to temper the excessive heat generated by the swift revolution of the other heavens, for Job tells us that there is concord and harmony in the heavens, and cold and humid waters would be contrary to the celestial substance of the heavens. Therefore "the moderns" have in Bartholomew's opinion "investigated the inmost secrets of philosophy more profoundly," when, as Alexander of Hales states, they suggest that those waters are neither frigid, fluid, and humid, nor congealed, solid, and ponderous, but on the contrary very mobile and remarkable for their clearness and transparency. It is not because they are congealed but because they are transparent that this heaven is called crystalline.[1] In other words, the "waters above the firmament" are not really waters. And the original modern investigator who ventured to dispute Bede's authority on the subject of the waters above the firmament was not Alexander of Hales but, as we have seen, William of Conches, whom Bartholomew lists in his bibliography and quotes in other passages, although he does not mention him by name here.

The empyrean heaven: Rabanus.

Of the other heavens Bartholomew gives most space to the empyrean. It is by nature immobile and unmoved and consequently is not essential like the other heavens for the continued generation of things in our inferior world, but rather, as Alexander of Hales says, to round out the

[1] VIII, 3.

universe and the types of bodies in it. Bartholomew continues: "The empyrean heaven is the first body, simplest in nature, the least corporeal, the subtlest, the first firmament of the world, largest in quantity, lucid in quality, spherical in shape, loftiest in location since farthest from the center, embracing in its amplitude spirits and bodies visible and invisible, and the abode of the supreme God; for God may be everywhere, yet he is said especially to be in the heaven, since there shines most powerfully the working of his virtue." [1] After this description of the last of the visible heavens as the abode of invisible spirits and of God Himself there does not seem to be much call for an invisible heaven, which Bartholomew himself seems by this time to have forgotten. For the passage just quoted he cites Rabanus as his source "who employs the words of Basil in the *Hexaemeron,*" but I have been unable to find the passage either in the *Hexaemeron* of Basil or the works of Rabanus Maurus.[2] Nor have I been able to find several other citations which Bartholomew makes from Rabanus in matters astronomical and astrological.

Alexander of Hales.

A word may be introduced concerning Alexander of Hales, whom Bartholomew has twice cited in the foregoing passages, but whom we probably shall not have occasion to mention again. Like Bartholomew, he was an Englishman and a Franciscan, and Bartholomew may have been either an attendant upon his lectures or his colleague at Paris. He died in 1245 and is known as one of the first to attempt to fit together previous Christian opinion and theology with the newly introduced works of Aristotle and writings of the Arabs. Of this we see evidence in the citations made from him by Bartholomew. But Alexander's field was primarily theology and not natural science.

While the saints may regard the heavens as manifold and list as many as seven of them,[3] the philosophers will

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[1] VIII, 4.

[2] At least as printed in Migne, PL.

[3] R. H. Charles, in discussing "The Seven Heavens—an early Jewish and Christian belief" (Morfill and Charles, *The Book of the Secrets of Enoch,* Oxford,

Aristotelian theory of one heaven.

admit only one heaven, says Bartholomew, who this time correctly quotes Basil as affirming in the *Hexaemeron* that "the philosophers would rather gnaw out their tongues than admit that there are many heavens." Bartholomew also presents Aristotle's view in the *Liber de celo et mundo* that the heaven is characterized by the greatest possible simplicity and purity and has no division or contrariety of parts. According to the new translation of *De celo et mundo* it is "a perfect complete unit to which there is no like, neither fabricated nor generated," and with an equal, single, and circular motion. In the *De causis elementorum* Aristotle holds further that the heaven is a fifth element, differing in natural properties and distinct from the four elements and not like them subject to generation and corruption.[1] Indeed, they would destroy one another by their mutual contrariety and repugnance were it not for the conciliating influence of celestial virtue.[2] But while the heaven is one, it has many orbs and circles of varying figure and magnitude, and there is a greater aggregation of light in the stars than in other parts of the sky. Such variations account for the varying or even contrary effects produced by the heaven in our lower world at different times and places, and explain why the pure sky causes corruption as well as generation here below.

As the basis of astrology.

The Aristotelian foundation thus laid for the superstructure of astrological science and art is apparently accepted by Bartholomew, who states that "the Creator established the heaven as the cause and origin of generation and corruption, and therefore it was necessary that it should not be subject to generation and corruption." In short, the universe divides into two parts. The heaven, beginning with the circle of the moon, is the nobler, simpler, superior,

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1896, pp. xxx-xlvii), asserts that after Chrysostom, "Finally such conceptions, failing in the course of the next few centuries to find a home in Christian lands, betook themselves to Mohammedan countries" (*Ibid.*, xxxi-xxxii). But Bartholomew ascribes to "the tradition of the saints" a belief in the plurality of heavens and a sevenfold division of them other than the planetary spheres.

[1] VIII, 2.

[2] VIII, 28.

and active portion of the universe. The other part, extending from the sphere of the moon downward to earth's center, is inferior, passive, acted upon and governed by the heaven. In all his later scientific and astrological discussion Bartholomew implies this hypothesis, and, after the two chapters which we have already summarized on the waters above the firmament and the empyrean heaven, pays no more attention to the seven heavens of the saints. The firmament, "called by the philosophers the first heaven and the last, in whose convexity are situated the bodies of stars and planets," absorbs his attention during the remaining forty-eight chapters of his eighth book. "By means of its motion, it is the effective principle of generation and corruption in the inferior world." Rabanus explains how its rays converge as toward a center upon the earth's surface and exert a concentrated impression there; and the science of perspective also illustrates this. The three less stable elements, air, fire, and water, obey the firmament even to the extent of local motion, as is illustrated by the tides. The element earth is not influenced in this way, but produces diverse species from itself in obedience to the celestial impressions which it receives.

Properties and effects of the signs and planets.

Bartholomew discusses the signs of the zodiac in much the usual astrological fashion. They are given animal names because in their effects they represent the properties of those animals.[1] In their effects, too, they may be distinguished as hot or cold, masculine or feminine, diurnal or nocturnal; and they are grouped in trios with the four elements and cardinal points and in varied relations with the planets. Each governs its portion of the human body; thus the Ram "dominates the head and face, and produces a hairy body, a crooked frame, an oblique face, heavy eyes, short ears, a long neck." [2] Each sign also has its bearings on human life; thus Virgo is "the house of sickness, of serfs and handmaids and the domestic animals. It signifies inconstancy and changing from place to place."[1] Bartholomew indeed devotes a separate chapter to "the properties and occult virtues" of each sign "according to the astrologers."[2] The seven planets by their progress through the signs and conjunctions in them influence every creature on earth.[3] Bartholomew outlines their successive control of the formation of the child in the womb. He also devotes a chapter to the influence of each planet. Mars, for example, "disposes men to mobility and levity of mind, to wrath and animosity and other choleric passions; it also fits men for arts employing fire such as those of smiths and bakers, just as Saturn produces agriculturists and porters of heavy weights, and Jupiter on the contrary turns out men adapted to lighter pursuits such as orators and money-changers."[4] Bartholomew also discusses the head and tail of the dragon as "two stars which are not planets but yet seem to have the nature and influence of the planets."[5] The fixed stars, too, have their influence, causing storms or clear weather and, according to the *mathematici,* presignifying sad or glad events. Bartholomew further sets forth the theory of the *magnus annus* or return of all the stars to the same positions after an interval of 15,000 or 36,000 years. "But whatever the philosophers have said concerning it, this much is sure that it is not for us to determine the last day."[6] God alone knows. Bartholomew's most frequently cited authorities on the subject of astrology seem to be Albumasar, Messahala[7] (Ma Sha' Allah), and Alphraganus.

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[1] VIII, 9.

[2] VIII, 10.

Bartholomew illustrates the general medieval acceptance of astrology.

Thus Bartholomew, a Franciscan in good standing, who lectured on the Bible at Paris and was called by the General of his Order to lecture in Saxony, in a work intended for elementary students and the general reader, far from engaging in any tilt with the astrologers or attacking their art as involving fatalism and contrary to morality and free will, affirms the general law of the control of earth by sky and repeats with little or no question a mass of astrological detail from Arabian writers. After such an exhibition as this of what a commonplace and matter-of-course affair astrological theory was in the thirteenth century, how impossible it is to have the least sympathy with those specialists in medieval learning who would have the work of Daniel of Morley shunned like the pest because of its astrological doctrine, or account for Bacon's imprisonment in 1278 by his astrological doctrine, or deny that Albertus Magnus could have written the *Speculum astronomiae* with its astrological doctrine. But of Bacon and Albertus more later.

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[1] VIII, 15.

[2] VIII, 21, which is the last of the twelve chapters.

[3] VIII, 22.

[4] VIII, 25.

[5] VIII, 31.

[6] VIII, 33.

[7] In the bibliography *Miselat astrologus;* in the text Misa., Misael, mesahel, Misalach, etc. I am convinced that none of these is meant for Michael Scot who is also listed in the bibliography but does not seem to be cited in the text.

Medieval divisions of the day and hour.

Bartholomew's ninth book deals with time and its parts. He defines a day as the time occupied by a complete revolution of the sun around the earth, and states that a day consists of twenty-four hours, or of four "quarters" of six hours each. But he seems unacquainted with our division of the hour into sixty minutes and the minute into sixty seconds. Instead he subdivides the hour into four "points" or forty "moments." Each moment is thus equivalent to a minute and a half of our time, and it may be divided further into twelve *unciae* (ounces), while each *uncia* includes forty-seven atoms, making 22,560 atoms in an hour as against 3,600 of our seconds. Honorius of Autun in his *De imagine mundi,* a work written presumably in the first part of the twelfth century, speaks of the hour as a twelfth part of the day, but makes it consist of four "points," forty "moments," and 22,560 atoms just as Bartholomew does. But Honorius also divides the hour into ten "minutes," fifteen "parts," and sixty *ostenta,* which last would correspond to our minutes, if his hour was of the same length as ours. Honorius does not mention the *unciae* of Bartholomew.[1] Bartholomew further tells us that Sunday is called the Lord's Day and is privileged in many particulars, since on it the world was created, the Lord was born, rose from the dead, and also sent the Holy Spirit. We have already presented Bartholomew's discussion of the Egyptian days in an earlier chapter.

Form and matter: fire and coal.

The tenth book, in nine brief chapters, is entitled, "Form and Matter," but after one chapter on form, discusses the elements. An element, according to Constantinus, is a simple substance and the least particle of a compound body. The rest of the chapters are devoted to the particular element fire and to things closely associated with it, such as flame, smoke, sparks, and ashes. *Carbo,* "Rabanus says, is fire actually incorporated and united with earthly matter." Bartholomew's further description suggests our coal, but perhaps he has only charcoal in mind.

Air and its creatures.

The eleventh book treats in sixteen chapters of the element air and its "passions," such as winds, clouds, rainbows, dew, rain, hail, snow, thunder and lightning, and leads up to the following book on birds, or rather, creatures of the air, since bees, flies, crickets, locusts, bats, and griffins are included in the alphabetical list of thirty-eight chapters. The birds described are for the most part familiar ones: the eagle, hawk, owl, dove, turtle-dove, quail, stork, crow, crane, hen, swallow, kite, partridge, peacock, pelican, screech-owl, sparrow, vulture, hoopoe, phoenix. Some of these creatures place precious stones in their nests to keep off snakes, the eagle employing the gem achates [2] and the griffin an emerald.[3]

The swallow, swallow-stone, and swallow-wort.

Swallows have gems called *celidonii* in their gizzards, one white and one red. The red variety is called masculine because it is of greater virtue than the white kind. These stones are especially valuable if they have been extracted from the chick before it touches the ground, "as is said in *Lapidarius* where their virtues are described as Constantinus says."[1] *Lapidarius* can scarcely mean Marbod's poem on gems, since he wrote later than Constantinus Africanus, and while he discusses the *chelidonius,* he says nothing of extracting it so soon and describes the colors of its two varieties as black and red,[2] and so does Bartholomew later on.[3] Marcellus Empiricus had called them black and white.[4] *Chelidonius* seems to be derived from the Greek word for swallow, χελιδών, and to mean the swallow-stone. Pliny mentions two varieties but simply states that they are like the swallow in color, not that they come from its gizzard. Furthermore he describes the color of one as purple on one side, of the other as "purple besprinkled with black spots."[5] Solinus mentions swallows but says nothing of any stone connected with them. Bartholomew, however, also mentions the herb *celidonia* or swallow-wort. He cites Macrobius for the story that, if anyone blinds the young of swallows, the parent birds restore their offspring's sight by anointing their eyes with the juice of this herb, a statement which is also found in Pliny.[6] Not only does the swallow contain gems of great virtue and know of healing herbs; it has medical properties itself. For instance, blood extracted from its right wing is a remedy for the eyes.

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[1] Migne, PL vol. 172, col. 147, "Hora . . . est duodecim pars diei, constans ex quatuor punctis, minutis decem, partibus quindecim, momentis quadraginta, ostentis sexaginta, atomis viginti duobus mil, quingentis et sexaginta."

[2] XII, 1.

[3] XII, 19.

The hoopoe and magic.

Of the birds described by Bartholomew the *upupa* or hoopoe is especially associated with the practice of magic. Pliny cites the poet Aeschylus as saying that the bird changes its form;[7] and from Aristotle to modern French peasants it has been believed to build its nest of human ordure.[8] After quoting Isidore, who in part uses Pliny,[1] for the bird's supposed filthy habits, its frequenting sepulchers, and the statement that anyone anointed with its blood will see demons suffocating him in his dreams, Bartholomew adds that its heart is used in sorceries. Students of nature (*Phisici*) say that when it grows old and cannot see or fly, its offspring tear off its outworn pinions and bathe its eyes with the juices of herbs—thus just reversing the relation between the swallow and its young—and warm it under their wings until its feathers grow again and, perfectly renovated, it is able to see and fly as well as they. In Basil's *Hexaemeron* a similar story is told of the filial devotion of young storks toward their aged parent. The hoopoe's renovation by its young also is included in the Latin bestiaries,[2] but Bartholomew appears to cite *Phisici* rather than *Physiologus*.[3] Thomas of Cantimpré's chapter on the hoopoe is similar to Bartholomew's except that all he says to connect it with magic is that anointing one's temples with its blood protects one from sorcerers and enchanters; but "how this is, Experimenter does not state." Vincent of Beauvais gives a somewhat fuller account of the hoopoe in his *Speculum naturale* and the bird's properties are also treated by Albertus Magnus in his *De animalibus*,[4] and in the *De mirabilibus mundi* ascribed to him, also by Petrus Hispanus in the *Thesaurus pauperum*,[5] and by Arnald of Villanova in *Remedia contra maleficia*. For the use of the bird's heart in magic Vincent cites a *Liber de natura rerum*, which perhaps is the *Liber rerum* cited by Thomas of Cantimpré, who, however, in that case failed to copy the statement in question. Vincent attributes to "Pythagoras in *The Book of the Romans*," the statement that sprinkling a sleeping person with the

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[1] XII, 21, "hi lapidi dicuntur celidonii et sunt preciosi maxime quando extrahuntur de pullo antequam tangat terram ut dicitur in lapidario ubi eorum virtutes describuntur, ut dicit Constan. Sanguis de dextra ala extractus oculis medetur. . . ." But perhaps the "ut dicit Constan." goes with these last words rather than the preceding.

[2] Migne, PL 171, 1750. In a number of other cases Bartholomew's citations of *Lapidarius* do not apply to Marbod.

[3] XVI, 30.

[4] *De medicamentis,* cap. viii.

[5] NH 37, 56.

[6] NH 25, 50.

[7] NH 10, 44.

[8] Bostock and Riley, English Translation of Pliny's *Natural History,* London, 1890 (Bohn Library), II, 511 note. And see

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D'Arcy W. Thompson's note on Aristotle's *History of Animals*, IX, 15.

[1] *Etymologies*, XII, vii, 66, in Migne PL 82, 468.

[2] Cahier (1851); *De bestiis*, I, 51, ascribed to Hugh of St. Victor, in Migne PL 177, 50.

[3] *Phisici* in the printed edition used; in BN 16099, fol. 97r, *ph'i;* BN 347, fol. 126r, *ph'ici*. In the work of Thomas of Cantimpré, however, BN 347B, 14th century, fol. 104v, *"Dicit ph's"* which may stand for Physiologus, Philosophus, or Phisicus.

[4] *De animal*, XXIII, 111.

[5] *Thesaurus pauperum*, cap. 85.

blood of the hoopoe will cause him to see phantasms of demons, which is essentially the same statement that Bartholomew draws from Isidore and Pliny. But Bartholomew sometimes cites Pythagoras in *The Book of the Romans.* These instances show the difficulty of dealing with medieval citations, but on the whole indicate that Vincent used independently the same sources as Thomas and Bartholomew and made a different selection from them.

Waters and fish.

In the thirteenth book Bartholomew deals with the element water, with wells, streams, seas, ponds, pools, and drops of water, with some particular bodies of water such as the Tigris, Euphrates, Jordan, Lake of Tiberias, and Mediterranean Sea. In the last chapter fish are considered. As in the account of birds, use is made of Isidore and Pliny, notably concerning the cleverness with which fish escape the snares laid for them by fishermen. Some fish are said to help their fellows withdraw from the basket-like traps set for them by fishermen by seizing their tails in their mouths and pulling them out backwards. Aristotle, too, is cited and Avicenna is referred to several times on the question whether a particular fish is edible or not. But an authority especially employed in this chapter is Jorath or Iorat, who in the bibliography at the end of the work is called a Chaldean. From his book on animals Bartholomew takes such details as that there are fish who live only three hours, who conceive from dew alone or in accord with the phases of the moon and the rising and setting of the stars. Dolphins, when a man is drowning, can tell from the odor whether he has ever eaten the flesh of a dolphin. If he has not, they rescue him and bring him safe to land; if he has, they devour him on the spot.

Jorath on whales.

Bartholomew also depends upon Jorath for his account of whales, which were not treated of by Pliny. The whale possesses a superabundance of sperm which floats on the water and, when collected and dried, turns to amber. When hungry, the whale has only to open its mouth and emit a fragrant odor like amber, and the other fish, attracted and de-lighted thereby, swim into its jaws and down its throat. On some occasions, however, this pleasant breath, if it may be so termed, of the whale saves the other fish instead of luring them on to destruction. When a certain serpentine and venomous fish approaches, they take refuge behind the whale, who then repels the fetid odor of the newcomer by the sweetness of his own effusion. While Bartholomew lists the whale along with fish, he notes that Jorath says that terrestrial matter dominates in it over water, and that consequently it becomes very corpulent and fat, and in its old age dust collects on its back to such an extent that vegetation grows there and the creature is often mistaken for an island and lures sailors to their destruction,—a reminiscence, we may suppose, of one of Lucian's stories. So fat is the whale that he must be wounded deeply to feel it at all, but once his inner flesh is reached by the weapon, he cannot endure the bitterness of the salt water, seeks the shore, and is easily captured. The whale cherishes its young with wondrous love, and when they are stranded on shoals it frees them by spouting water over them. When a severe storm is raging, it swallows them and they abide safely in its belly until the storm is past, when it vomits them forth again.

Geography, physical and political.

In the fourteenth book Bartholomew treats of earth, and besides defining mountains, hills, valleys, plains, fields, meadows, deserts, caves, and ditches in general, describes over thirty particular peaks or mountain ranges, most of which are named in the Bible, like Ararat, Bethel, Hermon, Hebron, and Horeb. But in the fifteenth book, on Provinces, his geography is that of classical antiquity and of the feudal world of his own time rather than that of Scripture. Where the medieval region was known under the same name in antiquity, he is apt to continue to use the old description of it, even though it may be really out-of-date and no longer closely applicable. Sometimes, however, as in the chapter on Burgundy, he uses only a little of Isidore's description and apparently writes the rest of the paragraph from personal knowledge. And in the case of new localities and names, for which he can find no ancient and early medieval authorities, he describes the province intelligently and accurately as it is in his own time. On the whole his account, although its 175 chapters are brief, is of considerable value [1] for the political geography of Europe in the thirteenth century, both as a general survey showing what regions he deemed important enough to mention [2] and what he thought might be omitted, and also often for particular details concerning particular places, while it is sometimes enlivened by the spice of local or racial prejudice.

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[1] Yet neither Bartholomew of England nor Thomas of Cantimpré is mentioned by C. Kretschmer, *Die physische Erdkunde im christlichen Mittelalter*, 1889, although he uses Neckam, Vincent of Beauvais, Albertus Magnus, and Roger Bacon.

[2] Bartholomew's list of provinces with the Latin name anglicized in some cases is as follows. Asia, Assyria, Arabia, Armenia, Aradia, Albania (*i.e.*, in Asia), Attica, Achaia, Arcadia, Alania (land of the Alani), Amazonia (land of the Amazons), Alemannia, Anglia (England), Aquitaine, Anjou, Auvergne, Apulia, Africa, Asturia, Aragon, Babylonia, Bactria, Braciana, Brabant, Belgica, Bithynia, Britannia, Boecia (Boeotia), Bohemia, Burgundy, Cappadocia, Chaldea, Cedar, Kent, Cantabria, Canaan, Campania, Cauda, Cilicia, Cyprus, Crete, Cyclades, Choa, Corsica (later occurs a longer chapter on Korsica), Dalmatia, Denmark (Dacia), Delos, Dedan, Europe, Evilath, Ethiopia, Egypt, Hellas, Eola (Aeolia?), Franconia, Francia (*i.e.* France), Flanders, Fenix (Phoenicia?), Phrygia, Frisia, Fortunate Islands (Canaries), Galilee, Gallacia (in central Europe), Gallicia (in the Spanish peninsula), Gaul, Gadis, Greece, Isle of the Gorgons, Gothia and the island of Gothland (Sweden and Gotland), Guido, India, Hyrcania, Idumea, Judea, Iberia, Italy, Spain (Hispania), Ireland (Hibernia), Icaria, the island in the salt sea (De insula in salo sita), Carthage, Carinthia, Lacedemonia, Lithuania (Lectonia), Livonia, Lycia, Lydia, Libya (Lybia), Lorraine (Lothoringia), Lusitania, Mauritania, Macedonia, Magnesia, Mesopotamia, Media, Melos, Midia, Meissen, Mytilene, Nabathea, Norway, Normandy, Numidia, Narbonensis, Ophir, Holland (Ollandia), Orcades, Paradise, Parthia, Palestine, Pamphylia, Pannonia, Paros, Pentapolis, Persia, Pyrenees, Pigmy-land, Poitou (Pictavia), Picardy, Ramathea, Reucia, Rivalia, Rinchonia, the Roman province (*i. e.*, Provence), Romania, Rhodes, Ruthia, Sabaea, Samaria, Sambia, Sabaudia, Sardinia, Sarmatia, Samos, Saxony, Sclavia (land of the Slavs), Sparta (Sparciata), Seres (*i.e.*, China), Seeland (Zeeland), Semogallia, Senonensis (region about Sens), Syria, Sichima, Scythia, Sicyon, Sicily, Sirtes, Scotland (Scotia), Suecia (Sweden, before called Gothia), Suevia (Swabia), Tanatos, Taprobana, Thrace, Traconitida, Thessaly, Tenedos, Thule, Tripoli (two are distinguished in Syria and Africa respectively), Tragodea, Troyland, Tuscany (Thuscia), Thuringia, Thuronia (the region about Tours), Gascony (Vasconia), Venice, Westphalia, Vironia, Finland, Vitria, Iceland, Zeugia.

Also economic.

Citing Isidore, Bartholomew divides the world as in a T map into Asia, occupying one-half the circle, and Europe and Africa each occupying a quarter. Indeed he says later that Africa is smaller than Europe;[1] Africa of course had not yet been circumnavigated. In speaking of Alemannia he alludes to other provinces "in either Germany" which are not included in his list of chapter headings: Austria and Bavaria near the Danube, Alsace along the Rhine, "and many others which it would be tedious to enumerate one by one." [2] He describes Apulia as the maritime region in Italy separated from the island of Sicily by an arm of the sea, and as a very populous land, full of gold and silver, rich in grain, wine, and oil, famous for its renowned cities, well fortified in castles and towns, fertile and fecund in varied crops. Brindisi (Brundusium) is its metropolis, and across the sea from Apulia to the south is Barbary.[3] Bartholomew thus uses the term "Apulia" as "Le Puglie" is used today, to include both ancient Apulia and Calabria, which he does not mention by that name. His description testifies to the greater prosperity of that region under the Normans and Frederick II than in later times, and also shows that Bartholomew is not blind to economic conditions in his survey of various regions. He is very apt, indeed, to tell whether the soil is well-watered and fertile or rocky and arid, and to describe the other resources of the district and the characteristics of the peoples inhabiting it. He speaks in high praise of the extensive dominions and sea-power of Venice and of the justice and concord of its citizens.[4] He also recognizes the importance of the wool trade between England and Flanders.[5]

Medieval boundaries.

Bartholomew often undertakes to state the boundaries of a region under discussion. Sometimes he is clear and convincing in this, as when he states that Gascony used to be a part of Aquitaine, that it is bounded by the Pyrenees, the Ocean, and the county of Toulouse, and approaches the territory of the Poitevins to the north; that it is drained by the Garonne river and that Bordeaux is its metropolis.[1] Sometimes his statements are confusing, but we must remember that feudal states were very difficult to bound exactly and varied greatly in extent from time to time. Some mistakes in the points of the compass are perhaps slips of copyists rather than of Bartholomew. He speaks of Brabant and Lorraine as the westernmost or frontier provinces of Germany. Brabant is bounded on the north by Frisia, the Britannic Ocean (North Sea), and the Gulf of Flanders; on the west by lower Gaul and on the south by upper France. It is watered by the Meuse and Scheldt.[2] Lorraine is bounded by Brabant, the Rhine, Alsace, the region of Sens, and Belgic Gaul. Metz is located in it.[3] Flanders is a province of Belgic Gaul next the seacoast, with Germany to the east, the Gallic sea to the west, and the region of Sens and Burgundy to the south.[4]

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[1] XV, 19.
[2] XV, 13.
[3] XV, 18.
[4] XV, 169.
[5] XV, 58.

France in the thirteenth century.

Bartholomew is uncertain whether France is named from the Franks or from a free hangman (*a franco carnifice*) who became king at Paris and from whom the executioners received privileges. Isidore does not mention *Francia,* so that Bartholomew does not derive this etymology from him. He seems uncertain also whether to identify France with all ancient Gaul or simply with Belgic Gaul. He would carry it south only to the province of Narbonensis and the Pennine Alps, but east to the Rhine and Germany. This perhaps is an attestation of the growing territorial power of the French monarch, but perhaps is also a hold-over from the ancient boundaries of Gaul. At any rate many of his other regions would overlap and conflict with a France of this size. He extols the stone and cement about Paris, which give it an advantage over other localities in building construction, and he further eulogizes the city itself as the Athens of his age which elevates the science and culture not of France only but all Europe.[5]

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[1] XV, 168.

[2] XV, 25.

[3] XV, 92.

[4] XV, 58.

[5] XV, 57.

Brittany and the British Isles.

Léopold Delisle, writing in the *Histoire Littéraire de la France,* endeavored to claim Bartholomew as a Frenchman, despite the *Anglicus* that regularly accompanies his name. Yet for all Bartholomew's praise of Paris and Venice, his chapters on England, Ireland, Scotland, and Brittany[1] are alone almost enough to determine his nationality. He asserts that Brittany should be called *Britannia Minor,* and the island *Britannia Maior* or Great Britain, since Brittany was settled by fugitive Britons from the island and the daughter should not be raised to an equality with the mother country, especially since it cannot equal Great Britain either in population or merit.[2] Also Bartholomew represents the Irish as savages[3] and describes the Scots in very unfavorable terms. His view is that if they have any good customs, they borrowed them from the English. He admits, however, that the Scots would be good-looking in face and figure, but then adds the insulting condition, if they would not insist on deforming themselves by wearing their national costume.[4] But as for England, or Albion as it was once called, after describing it as the largest island in the (Atlantic) ocean and recounting some of its legends and history, Bartholomew quotes a metrical description of it as a fertile corner of the world, a rich island which has little need of the rest of the world but whose products all the rest of the world requires, and whose people are happy, jocose, and free of mind, tongue, and hand.[1] Censure of and prejudice against all others who claim to be British, ill-concealed insular pride! Who can doubt that the writer is an Englishman?

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[1] Of these four chapters Delisle (HL XXX, 353-65) quoted only that on England. Delisle gave extracts from Bartholomew's descriptions of several French provinces to show that he knew them well and stated that he gave much fewer details concerning England, but that he (Delisle) would transcribe the chapter "parce qu'on pourrait supposer qu'il renferme des allusions à la prétendue origine anglaise de Barthélemi." Delisle also cited (p. 362) the chapter on Britannia, but omitted the statements which I shall cite, and earlier said (p. 358), "Nous n'avons rien à relever dans les chapitres de la Normandie, de la Bretagne," etc.

Yet the statements I shall cite occur in both the MSS which Delisle used, where the chapter on Britannia is continued beyond the point where his quotation leaves off as follows:

BN 16098, 13th century, fol. 140r. "Est autem alia britannia minor super oceanum aquitanicum sita in partibus galliarum que a britonibus relinquentibus britanniam maiorem propter importunitatem germanorum est usque hodie populata, vero usque adhuc genus britonum et nomen perseverat. et quamvis hec britannia in multis laude digna sit, non potest tamen filia matri, minor britannia maiori comparari, et immo bene minor britannia debuit vocari que sicut nec numero populi sic nec merito soli potest maiori britannia adequari."

BN 347, 14th century, fol. 145, is the same except that tamen precedes *potest,* and that the words *minor britannia maiori comparari et immo bene* are omitted, evidently by the mistake of a copyist who has jumped from one *minor* to the next *minor* and thus inadvertently omitted the intervening words.

[2] XV, 28.

[3] XV, 80.

[4] XV, 152.

A geography by Herodotus.

Some writer named Herodotus is cited a good deal by Bartholomew for such regions as Poitou, Picardy, Saxony, Sclavia, Scotland, and Thuringia, of which the Greek historian Herodotus of course knew nothing and said nothing.

Two passages about magic.

The inhabitants of Finland, we are told, are a barbarous race "occupied with magic arts." They practice divination by means of the number of knots in a ball of thread and sell favorable winds to the sailors who navigate along their shores. In reality, Bartholomew explains, the demons send the winds or not, in order to secure the souls of the Finns in the end.[2] While we are on the subject of magic, a passage from Bartholomew's next book may be noted.[3] Discussing the gem Heliotrope, he cites Isidore for the statement that "it manifests the stupidity of enchanters and magicians who glory in their prodigies, for they deceive men's eyes in their operations just as this gem does, of which he says by way of illustration that together with the herb of the same name and certain incantations it deceives the gaze of the spectators and causes them not to see the man who carries it." But when we turn to the *Etymologies*,[4] we find that Isidore simply quotes the sentence of Pliny, "This too is a manifest instance of the impudence of the magicians that they say that the bearer of this stone cannot be seen if he joins to it the herb Heliotrope and adds certain prayers." Bartholomew has evidently put his own interpretation upon the passage.

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[1] XV, 14.

[2] XV, 172.

[3] XVI, 41.

[4] *Etymol.*, XVI, 7.

Bartholomew and Arnold of Saxony on stones.

The last passage has introduced us to Bartholomew's sixteenth book on gems, minerals, and metals. Valentin Rose,[1] in what Langlois praised as "sa belle dissertation sur le *De lapidibus* aristotélique et sur le *Lapidaire* d'Arnoldus Saxo," [2] exploited a hitherto obscure German writer, Arnold of Saxony, who appears to be cited only by Vincent of Beauvais and of whose works but a single manuscript is known. Yet Rose would have us believe that Albertus Magnus made much use of him without acknowledgment in his work on minerals [3] and that Bartholomew did the same in his sixteenth book. I shall endeavor to show that it is much more likely that Arnold copied Bartholomew. First, it is less likely that Bartholomew, who was called to Magdeburg to instruct the Saxons, possibly after his *De proprietatibus rerum* had been completed, would have borrowed from one of them than that the opposite should be the case. Second, Bartholomew's work is much fuller than Arnold's which Rose admits is "meager and mechanical." Third, Bartholomew's work is professedly a compilation; his object is to cite his authorities and he usually does so scrupulously; hence if he made much use of Arnold, he would certainly mention him somewhere. Fourth, in descriptions of particular stones Arnold of Saxony cites no authorities but merely makes the lump statement at the start that he uses Aristotle, Aaron and Evax, by whom he means Marbod's poem, and "Diascorides"; Bartholomew on the other hand in the case of each gem makes distinct citations from Isidore, *Lapidarius*,[4] and "Diascorides," all of whom he is evidently using directly but with discrimination and in different combinations in each particular case. Fifth, the same stones are treated more fully by Bartholomew than by Arnold, whose terse descriptions suggest the style of an abbreviator. Thus Bartholomew devotes two columns to the sapphire; Arnold gives it but eleven lines. Sixth, although Rose denied that Arnold used Aristotle and "Diascorides" except in his other work *De virtute universali,* and contended that in his *De virtutibus lapidum* he used only Marbod and one other unknown source, in point of fact almost every passage in Arnold which Rose refers to this unknown source is given by Bartholomew as from "Diascorides." If, therefore, Arnold's unknown source is not "Diascorides," it must be Bartholomew. The natural inference is that while Bartholomew has made direct use of some treatise passing under the name of Dioscorides, Arnold has not seen this treatise itself but has probably condensed or extracted it at second-hand from Bartholomew without acknowledging his indebtedness to Bartholomew at all and only vaguely acknowledging his debt to "Diascorides" in his preface. This inference is supported by the use made of Isidore on stones by our two authors; Bartholomew uses Isidore directly and cites book and chapter; Arnold repeats indirectly through Marbod a bare skeleton of brief phrases which originally were in Isidore.[1]

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[1] V. Rose, "Aristoteles De Lapidibus und Arnoldus Saxo," in *Zeitschrift für deutsches Alterthum,* XVIII (1875), 321-455.

[2] Langlois (1911), p. 124.

[3] J. Ruska, *Das Steinbuch des Aristoteles,* 1912, p. 38, reiterates, "Sein Büchlein *De virtutibus lapidum* ist die Grundlage des Steinverzeichnisses in Albertus Magnus' 5 Büchern *De mineralibus.*"

It also is asserted that Vincent and Albert learned of the mariner's compass from this Arnold's *De virtute universali,*—a view which overlooks Alexander Neckam's earlier allusions to the compass.

[4] This title can scarcely refer to Arnold's *De virtutibus lapidum.*

Citations by Arnold of Saxony and by Bartholomew.

Rose further asserted, without printing the passages in question to support his contention, that Albertus Magnus had simply copied a number of citations from Arnold, such as Jorach on animals, Pictagoras in *The Book of the Ro-*

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[1] The fact is that Rose examined the text of Bartholomew in a careless and superficial manner. He used some Frankfurt edition of the *De proprietatibus rerum* for which he gives no date, and he usually fails to state what chapter of Bartholomew he is citing, but refers to him simply by the letter B. Also he fails to note that the first two stones listed by Arnold, namely, *abeston* (asbestos) and *absictus* (*apsyctos*) are both in Bartholomew, and what is more, are spelled exactly the same by both authors. Nor are these the only gems that Rose fails to note are treated of by both authors. Others are *alabandina, calcofanus* (which Bartholomew begins with a k), *virites* or *pyrites* (also spelled a little differently in Bartholomew), and *turcois* (*De turchoge* in Bartholomew). In the first three of these four passages Arnold's statements sound like a bald and abbreviated copy of Bartholomew's description.

mans, Esculapius in *De membris,* Zeno in *De naturalibus,* Velbetus in *De sensibus,* and Alchyldis *De venenis.* But we have already noted that Bartholomew cites Jorath and Pythagoras; Zeno, too, is in his bibliography, and in the introduction to his eighteenth book he cites the *Liber Escolapii de occultis membrorum virtutibus.* Vincent of Beauvais also cites these works more than once. I do not believe that Bartholomew took his citations from Arnold, and I doubt if either Albert or Vincent did. The probability is that such books were common property then, however little may be known about them today, and that it would be as easy then for anyone to lay his hand on these books as on the works of Arnold of Saxony, whom Vincent alone mentions. In discussing other mineral substances than gems, such as metals, sulphur, salt, soda, glass, Bartholomew cites Aristotle, Avicenna, and Platearius as well as *Lapidarius,* Isidore, and "Diascorides," but in the seventeenth book on trees and herbs he continues to cite "Dyascorides" and Isidore, although also making extensive use of Pliny. In the eighteenth book on animals his list of authorities widens again and he cites Solinus, Papias, Marcianus, Aristotle, Theophrastus, Avicenna, and Isaac, but Pliny continues to be his chief reliance.

Virtues of animals.

In the introduction to this book Bartholomew takes the view, supported by the authority both of Pliny and of John of Damascus,[1] that all kinds of animals were created for man's benefit. Even fleas and vermin, like wild beasts and reptiles, are useful in leading him to recognize his own infirmity and to invoke the name of God. But furthermore "there is nothing in the body of an animal which is without manifest or occult medicinal virtue." Escolapius in *The Occult Virtues of Members* states that hemorrhoids may be cured by sitting on a lion's skin, and Bartholomew lists other examples of amulets, ligatures, and suspensions from Pliny and the *Viaticum* of Constantinus Africanus as well as "Dyascorides" and "Pitagoras in *The Book of the Romans.*" The knowledge of medicinal herbs and the semi-human emotions or moral virtues supposed to be possessed by animals also receive the usual treatment. Bartholomew informs us that the deadly basilisk loses its venomous character when burned to an ash, and that its ashes are considered useful in operations of alchemy and especially in the transmutation of metals.[1] Jerome and Solinus are cited concerning dragons who overturn ships by flying against their sails, and of the use made by the Ethiopians of the blood of dragons against the summer's heat and of their flesh for divers diseases. For as David says, "Thou gavest him for food to the peoples of Ethiopia." [2] Marvelous monsters of India are not forgotten, and Aristotle is cited concerning a terrible man-eating wolf in India with three sets of teeth, a lion's foot, a scorpion's tail, human face and voice. Its voice is furthermore terrible like the sound of a trumpet, and it is swift as a deer.[3] Bartholomew's credulity and scepticism vary with the attitude of his authorities. When he finds them in disagreement over the question whether the beaver castrates itself in order to escape its hunters—Cicero, Juvenal, Isidore, and Physiologus asserting this, while Pliny, Dyascorides, and Platearius deny it—he prefers the arguments of the latter, especially since the experience of his own time supports their view.[4]

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[1] John of Damascus, who wrote on theology, dialectic, and so forth in the first half of the eighth century (works in Migne, PG vols. 94-96) became well known to western writers through the twelfth century translation of him by Burgundio of Pisa. Some of the works ascribed to him are probably spurious, but "his undoubted works are numerous and embrace a wide range." A chapter is devoted to the introduction of his writings into western Europe in J. de Ghellinck, S. J., *Le Mouvement théologique du XIIe siècle, Études, Recherches, et Documents,* Paris, 1914; see EHR (1915), p. 112. But see Steinschneider (1866), pp. 375-91.

Physiologus.

Physiologus is cited a number of times [5] by Bartholomew concerning the snake, crocodile, elephant, wolf, wild ass or *onager,* the onocentaur who is half human and half ass, panther, siren, and taxo or melus. Rather strangely he does not cite Physiologus in describing the lion. Bartholomew's citations of Physiologus bear out the points we have made in an earlier chapter that Physiologus is one thing, and the allegorical interpretation of passages cited from Physiologus another thing, that Physiologus means what it says, "Natural Scientist," and not allegorist or moralizer. For although a primary purpose of Bartholomew's own work is supposed to be the elucidation of the truth concealed in Scripture under the symbolism of natural phenomena, he cites Physiologus simply for zoological data and omits entirely the moral application and spiritual allegory which it has become customary to associate with the term Physiologus. Moreover, much which Bartholomew ascribes to Physiologus cannot be found in any of the bestiaries which are commonly associated with that name.[1] This again shows how the middle ages added to its ancient authorities.

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[1] XVIII, 15.

[2] XVIII, 37.

[3] XVIII, 69.

[4] XVIII, 28, "et hoc quotidie patet in castoribus qui in diversis locis inveniuntur."

[5] XVIII, 8, 32, 43, 69, 76, 77, 80, 95, 101.

Color, odor, savor, liquor.

In his nineteenth and last book Bartholomew states that he will treat "first of color, then of odor, then of savor, last of liquor." The discussion of color occupies the first thirty-six chapters in which Aristotle is more frequently cited than any other authority. The citations become less numerous from chapter eleven to thirty-six [2] while particular colors are being described, and where Bartholomew perhaps gives us some original information. Isaac seems to be Bartholomew's chief authority in the chapters upon smell and taste. Concerning the latter matter Bartholomew states that the theories of philosophers and medical men disagree.[3] Under the caption of Liquor he describes honey, mead, *claretum* (which was a mixture of wine, honey, and spices), milk, butter, and cheese. These last suggest eggs, and chapters 77 to 113 are devoted to those of various animals. The work then proceeds to consider weights and measures, and concludes with chapters describing various musical instruments.[1]

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[1] Lauchert (1889), p. 105, has recognized this fact, saying of the *De proprietatibus rerum,* "worin ebenfalls der Physiologus häufig citirt ist und auch für Manches das nicht aus ihm stammt."

[2] In reading the printed edition I thought that some of these chapters might be later interpolations, since after *minium* has been described in chapter 16 it is again considered in chapter 25, and *indicum* is similarly discussed in both chapters 21 and 31. But these chapters are also repeated in BN 347, 16098, and 16099.

[3] XIX, 40.

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[1] These matters are found in BN 16098 and 16099 as well as in the printed edition. "Explicit Tractatus de proprietatibus" precedes the bibliography in BN 16099, follows it in BN 16098.

CHAPTER LV

ROBERT GROSSETESTE

Chief sources for Robert Grosseteste—Reasons for Roger Bacon's eulogy—Grosseteste's scholarly career—His writings: absence of magic—His scientific writings little affected by his ecclesiastical position—Reliance on experience—Theory of vision and science of perspective—Experimental discovery of lenses—Mentioned also in *The Romance of the Rose*—Theories formed by experimenters with lenses—Mathematical physics: the radiation of virtue—The *Computus* and calendar reform—Juggling with numbers—From mathematics to astronomy to astrology—Astrology in natural philosophy, agriculture, alchemy, medicine and music—Some astrological technical detail—Man and the stars—Grosseteste's theory of comets—Alchemy—Other treatises—*Summa philosophiae* ascribed to Grosseteste—Its contents—Oriental origin of philosophy—Greek men of learning—Arabs and medieval Christians—Ancient and modern science compared—Criticism of Aristotle and the Arabic text—Use of the word "modern"—Theology, philosophy, and science; speculative and experimental—Astrology in the *Summa*—Occult virtue and alchemy—Brother Giles on the comet of 1264—Appendix I. The Perspective or Optics of Witelo.

Chief sources for Robert Grosseteste.

THE fame of Robert Grosseteste,[1] who lived from about 1175 to 1253 and was bishop of Lincoln during the last eighteen years of his life, rests largely upon the praises of his countrymen and contemporaries, Matthew Paris and Roger Bacon, and upon his own writings. The historian, Matthew Paris, depicts him especially as the man of affairs, the churchman and statesman who dared oppose either king or pope for England's sake. But with his repeated resistance in parliament to royal financial exactions, his outspokenness against abuses at the papal court and his refusal to admit papal provisors to benefices in his diocese, his aggressive and reforming activity in his bishopric and consequent quarrels with the monastic orders and his own cathedral chapter—with all this side of his career we are little concerned. It is rather as a great scholar of his time that like Roger Bacon we shall look back upon him.

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[1] References to Grosseteste's works, unless otherwise stated, will be to Ludwig Baur, *Die Philosophischen Werke des Robert Grosseteste,* Münster, 1912, in Baeumker's *Beiträge zur Geschichte der Philosophie des Mittelalters,* Vol. IX. This edition seems to make little effort to correct errors of case or number in the MSS, so that much of the text is far from being smooth reading. Baur discussed *Die Philosophie des Robert Grosseteste* in Vol. XVIII (1917) of the same series. The life of Grosseteste is treated briefly in DNB, and more fully in the old and pedantic work of Samuel Pegge, *The Life of Robert Grosseteste,* London, 1793, 385 quarto pages with many foot-notes and appendices, which however are based mainly on the works of preceding antiquaries, the author stating in his preface, "my private station as a country clergyman would not permit me to have much access to public libraries, but the materials were chiefly to be sought for in a book-room which, you will easily suppose, cannot be very richly or amply furnished." Pegge's Life was already described in 1861 as "one of the scarcest of modern works"; but the British Museum possesses two copies. Other biographies are by J. Fel-

Reasons for Roger Bacon's eulogy.

Bacon's eulogies of Grosseteste may seem rather extravagant. Writing fourteen years after his death he thinks that no living scholar can compare with him, nay, he ranks him and Adam Marsh, another Englishman of whom we know little, as in their day what Solomon, Aristotle and Avicenna were in theirs.[1] One reason for this high praise is presumably that Grosseteste had been Bacon's favorite teacher, and certainly that he was interested in the same learned pursuits, Greek and Hebrew, mathematics, optics, experimental science, as the friar who followed him. Roger practically admits that he owes much in those fields to Robert and an examination of Grosseteste's writings makes this fact still more evident.

Grosseteste's scholarly career.

A letter by Giraldus Cambrensis written before the close of the twelfth century speaks of the then youthful Grosseteste as already proficient in law and medicine. He seems to have been born of humble and poor parents at Stradbrook in Suffolk.[2] He was educated at Oxford where he became

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ten, Freiburg, 1887, and F. Stevenson, London, 1889. The letters of Grosseteste, which do not especially concern us, are edited by H. R. Luard in RS XXV, 1861.

Not to be confused with Grosseteste is Robertus Anglicus who wrote a commentary on the *Sphere* of Sacrobosco in 1271, a *Tractatus quadrantis* at Montpellier in 1276 (printed 1508), and *Canons for the Astrolabe* (printed at Colle about 1478): see Duhem, III (1915), pp. 292, 298.

[1] Brewer, 70 and 75.

[2] Pegge (1793), p. 8, and Appendix II.

rector scholarum and Chancellor and in 1224 the first rector of the Franciscans at Oxford. He perhaps also studied at Paris. After holding various archdeaconries and other prebends he was elected bishop of Lincoln in 1235 but continued his interest in the welfare of the university at Oxford. Roger Bacon, in affirming that Grosseteste surpassed all others in knowledge of the sciences, gives as a reason his long life and experience as well as his enthusiasm for study;[1] and in another passage declares that hitherto it has taken thirty or forty years for a man to become really proficient in mathematics, as the case of Robert Grosseteste among others shows.[2] Bacon also states that it was not "until the latter portion of his life" that he undertook the work of making translations and summoned Greeks and had grammars brought from Greece and other lands. Since Grosseteste appears at first to have studied law and medicine rather than ancient languages and mathematical sciences, Bacon's statements suggest that the works of Grosseteste which we are about to consider were written late in life. This inference is further borne out by a passage in the treatise *De impressionibus aeris seu de prognosticatione* which gives the positions of the seven planets in the signs of the zodiac and states the date as "the Arabic year 646 or the year of grace 1249."[3]

His writings: absence of magic.

Our discussion of Grosseteste will be based upon some treatises included in Baur's edition of his philosophical works. They are mostly brief and in some cases seem rather fragmentary. We shall not be concerned with his Greek grammar or with his theological writings, which occupy half of the bibliography in Pegge's Life.[4] His letters contain some hints of his scientific works but nothing bearing on magic or astrology. It used to be stated that Grosseteste certainly constructed charms to expel maladies, that he invented forms of words to exorcise fiends, and that he worked cures by engraved gems.[1] The ascription to Grosseteste of treatises on Necromancy and Sorcery, and the Philosopher's Stone, is, however, false and grew, Baur says, from marginal glosses appended to one of his genuine works.[2] What we shall note in Grosseteste's works will be mainly his attitude to experimental science on the one hand and to astrology on the other.

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[1] Brewer, 91; Bridges, I, 67.

[2] Brewer, 472.

[3] Baur, 49-50. If, on the other hand, the mention of an Arabic year indicates that the treatise is a translation of an Arabic work, the date would seem almost too late for Grosseteste to have effected the translation. It will be recalled that Bartholomew of England included "Robert of Lincoln" in his bibliography.

[4] Pegge (1793), 267-91.

Scientific writings little affected by his ecclesiastical position.

In these scientific treatises by Grosseteste there is little to suggest the Christian bishop. However, in the work "On the Fixity of Motion and Time" he opposes the Aristotelian doctrine that the universe or motion of the celestial bodies is eternal.[3] And in a second treatise, "On the Order of the Emanation of Things Caused from God," he expresses the wish that men would cease to question the scriptural account of the age and beginning of the world.[4] A third treatise "On Freedom of the Will" also lies on the frontier of philosophy and theology.

Reliance on experience.

Grosseteste affords us further examples in a number of passages of that reliance upon experience and reason, that rejection of certain views as contrary to experience, and yet that acceptance of statements in old authors as based upon experience, which we saw in Galen and William of Auvergne's "experimental books," and shall see in Albertus Magnus and the other medieval scientists. Grosseteste speaks, however, not merely of experience or *experimenta,* but also of experimenters (*experimentatores*).[5] We may first note some use of observation and experience in astronomy and geography. In his treatise on comets he alludes to "experience in natural things."[6] In his treatise on the Sphere[7] Bishop Robert declares that the sphericity of the earth and of all the stars and planets "is shown both by natural reasons and astronomical experiences," that is, in the case of the earth, by the observations of the sky by men in different parts of the earth. In the same work he says that Thabit ben Corra (836-901 A. D.) working over the operations of Ptolemy, "found by certain experiments that the motion of the fixed stars was different."[1] Likewise in his treatise *On the Generation of the Stars* Grosseteste remarks of one contention that "experience shows the contrary" and of another view that it "is against both experience and reason."[2] Again in writing *Of the Nature of Places* he adduces in support of his positions "experiments and reasons," and "divers authors and experimenters."[3] The old legend of the Hyperboreans who dwell among mountains near the pole in such a salubrious and temperate climate that they live on and on until they tire of life and commit voluntary suicide by leaping off cliffs into the sea, Grosseteste introduces by the statement: "It has also been found by experience, as authors tell"—among whom he names Pliny, Solinus, and "Marcianus in his geometry."

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[1] Wharton, *Anglia Sacra,* II, 325-41, *de vita Grosteste auctore Richardo monacho Bordeniensо.* This life was apparently written about 1500.

[2] Baur, 124.

[3] Baur, 105.

[4] Baur, 150.

[5] Baur, 68.

[6] Baur, 36.

[7] In *Sacro Bosco, Joannes de, Sphera, cum commentis,* 1518, *Reverendissimi Episcopi Roberti Lincolinensis Sphere Compendium,* fol. 131 (B1). Baur, 13, *De sphaera.*

Theory of vision and science of perspective.

In the realm of physics Grosseteste not only mentions experience in discussing vision and what he calls Perspective but also brings to our notice a recent or approaching experimental discovery, that of magnifying lenses. In his treatise on the rainbow he makes a rather unpromising beginning. After arguing whether the sense of sight operates by the eye receiving something within itself, as natural philosophers are prone to hold, or by sending forth a visual species or rays, he decides as was usual with men of his time in favor of the latter alternative.[4] He cites Aristotle in his last book on animals as saying that a man with deep-set eyes sees farther because his visual virtue is not spread or scattered but goes straight—as if from a long-barreled gun—to the things seen.

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[1] Baur, 25, *De sphaera; Sacro Bosco*, fol. 133 (F2).

[2] *De generatione stellarum*, Baur, 33 and 34.

[3] *De natura locorum*, Baur, 68.

[4] *De iride, seu de iride et speculo*, Baur, 72-73.

Experimental discovery of lenses.

Grosseteste then goes on to say that there are three parts of Perspective. The first is that concerning the sight with which he has just been dealing. The second concerns mirrors. The third has been "untouched and unknown among us until the present time. Yet we know that Aristotle completed this third part"—he of course did nothing of the sort—"and that it is much more difficult in its subtlety and far more wonderful in its profound knowledge of natures than the other parts. For this branch of Perspective thoroughly known shows us how to make things very far off seem very close at hand and how to make large objects which are near seem tiny and how to make distant objects appear as large as we choose, so that it is possible for us to read the smallest letters at an incredible distance, or to count sand or grain or grass or any other minute objects." [1] So far the passage reads as if it might be merely the exaggerated dream of fancy. But Grosseteste proceeds to state "how these marvels happen," which seems to be by the breaking up of "the visual ray"—or as we should say, by the refraction of rays of light—as it passes through several transparent objects or lenses of varying nature. He explains also that great distance does not make an object invisible but the narrowness of the angle under which it is seen.[2] This he proceeds to illustrate "by experiments" (*per experimenta*). Again in his treatise on comets he mentions "those who have experienced that by a transparent figure interposed between the spectator and the object seen it is possible that the thing seen should be multiplied and that great things seem small and conversely according to the shape given the interposed transparent object." [3] I have given as far as possible a literal translation of Grosseteste's words on this point in order to convey his exact or inexact meaning. If these passages are not a sufficient proof that magnifying lenses of some sort were already discovered, they at least point the way to the microscope and telescope, and we know that eye-glasses for nearsightedness were in use at the latest by the end of the thirteenth century.

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[1] Baur, 74.
[2] Baur, 75.
[3] Baur, 41.

Mentioned also in *The Romance of the Rose.*

Very similar and perhaps copied from this very treatise of Grosseteste on the rainbow—or from its source (Al-Hazen)—are some verses in the continuation of the French *Romance of the Rose* written by Jean de Meun, probably about 1270. Besides remarking of rainbows that—the words are Ellis' translation—[1]

> "Only he who's learned the rule
> Of optics in some famous school
> Can to his fellow men explain
> How 'tis that from the sun they gain
> Their glorious hues;"

the poet mentions burning-glasses and various types of mirrors, and also tells us that from optics one

> ". . . may learn the cause
> Why mirrors, through some subtle laws
> Have power to objects seen therein—
> Atoms minute or letters thin—
> To give appearance of fair size,
> Though naked unassisted eyes
> Can scarce perceive them. Grains of sand
> Seem stones when through these glasses scanned."

The poet adds that by these glasses one can read letters from such a distance that one would not believe it unless he had seen it. Then he concludes:

> "But to these matters blind affiance
> No man need give; they're proved by science."

Theories formed by experimenters with lenses.

Returning to Grosseteste and experimental method we may note his mention in the same treatise upon comets of "those who reflect and experiment in natural phenomena and form their opinions from their experiments without foundation of reasons."[1] Grosseteste holds that such experimenters "necessarily fall into false notions concerning the natures of comets," because they try to explain them as reflected rays and the like after the analogy "of their varied experiments which they have employed in radiations and the producing of fires"—probably by burning glasses—"and by what is seen through the medium of lenses" (*diaphanorum*). The important point for us, however, is not whether these men were wrong about comets, but their varied experimentation and their basing of hypothesis upon their experiments.

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[1] In the Temple classics, vol. III, pp. 113-4.

Mathematical physics: the radiation of virtue.

In view of Grosseteste's interest in physical and astronomical matters, and his training, if we believe Bacon, for some thirty or forty years in mathematics, it is not surprising that he realized something of the value of mathematics in the study of natural science. He believed that a knowledge of geometry was of great aid to the "diligent investigator of natural phenomena" in explaining the causes of all natural effects. In a treatise "On lines, angles and figures," or "On refraction and reflexion of rays," Grosseteste holds that not only vision or light but every natural agent sends forth its virtue to the object affected and acts upon sense or matter along geometrical lines.[2] This doctrine of radiation or emanation of force seems to date back at least to Plotinus, and we have heard Alkindi among the Arabs in his treatise on Stellar Rays say that the stars and all objects in the world of the four elements emit rays of this sort. From any given agent virtue radiates forth in all directions, but a perpendicular line is the shortest and strongest line of force between it and any other single point or object. From a point or center of influence to a larger surface we get pyramids or cones of radiated force. The same theory is set forth by Roger Bacon under the name "multiplication of species" but even this wording is not new with him, since Grosseteste speaks of the natural agent as "multiplying its virtue" from itself to the thing affected, and then explains that this virtue is also sometimes called "species" and sometimes "similitude" and is the same in whatever way it is named.

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[1] Baur, 40.

[2] Baur, 60.

The *Computus* and calendar reform.

The *Computus,* or treatise on reckoning time and keeping track of Easter especially and also other church festivals, had been a variety of mathematical and astronomical exercise indulged in by the clergy even in the darkest periods of the early middle ages. The *Computus* of Grosseteste pointed out the need of reforming the Julian calendar then in use, and he also called attention to this need in his treatise on *The Sphere.* From the later use made of it by Roger Bacon[1] and by Cardinal Pierre d'Ailly[2] in the early fifteenth century one infers that Grosseteste's *Computus* remained an authoritative work upon the subject of calendar reform.[3]

Juggling with numbers.

On one occasion at least Grosseteste's interest in mathematics degenerated into one of those puerile reveries on the relations and perfection of certain numbers in which so many authors since Pythagoras, if not before him, had indulged. Having stated that in "the supreme body" there are four things, namely, form, matter, composition and compound, Grosseteste states that form is represented by the number one, matter by two, and composition by three, "since there is patent in it formed matter and materialized form and the property of composition itself."[4] The compound besides these three things has its own nature and so is represented by four. Now $1 + 2 + 3 + 4 = 10$. "Wherefore every whole and perfect thing is ten."

From mathematics to astronomy to astrology.

That Grosseteste's "mathematics" includes astronomy is indicated by his citing *"mathematicos"* as explaining that the sun burns the regions under the tropic of capricorn more than those under the tropic of cancer, because an eccentric of the sun when it is in capricorn brings it closer to the earth.[5] These mathematicians disagree on this point with the commentator upon Aristotle who believed that the sun burned more in Cancer. If for Grosseteste mathematics included astronomy, astronomy also included astrology—although he does not usually employ the word *mathematicus* for an astrologer. To his attitude toward astrology we now turn.

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[1] See below, chapter 61, p. 644.

[2] See the frequent citations of Grosseteste in his *De Correctione Kalendarii,* in an edition of the works of d'Ailly and Gerson printed about 1480.

[3] On the general subject, Kaltenbrunner, *Die Vorgeschichte der gregorianischen Kalendarreform,* 1876.

[4] *De luce seu de inchoatione formarum,* Baur, 58.

[5] *De natura locorum,* Baur, 69.

Astrology in natural philosophy, agriculture, alchemy, medicine and music.

Grosseteste accepts astronomy or astrology as the supreme science and says in his treatise on the liberal arts that natural philosophy needs its aid more than that of the others.[1] There is scarcely any operation whether of nature or of man, such as the planting of vegetables, or transmutation of minerals, or cure of diseases, which can dispense with astronomical assistance. For inferior nature does not act except as celestial virtue moves and directs it. He then goes on to detail the effects of the moon, Saturn, and Mars on the hour of planting, and then to emphasize the importance of selecting the favorable hours astrologically in medical practice and in alchemy where he associates the seven planets with seven metals.[2] He also argues that the harmony of the movements of the celestial spheres is found also in their effects upon the inferior world.[3] Therefore he who knows the due proportion of the elements in the human body and the concord of the soul with the body, can restore any lack of harmony in the same to its proper state.[4] In other words, diseases and even wounds and deafness should be curable by music based upon a knowledge of astrology and mathematics, and one should also be able to control such emotions as joy, grief, and wrath.

Some astrological technical detail.

In another treatise on how to predict the weather (*De impressionibus aeris seu de prognosticatione* [5]) Grosseteste says that one must know such things as the powers of the signs and the natures of the planets.[6] He then relates the four elements and four qualities to the planets and signs and proceeds to such further technical astrological terms as house, exaltation, *triplicitas, terminus, facies,* and aspect, and to an explanation of the effect of the eccentrics of the sun and moon upon inferior objects.[1]

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[1] *De artibus liberalibus*, Baur, 5.

[2] Baur, 6-7.

[3] Baur, 3.

[4] Baur, 4-5.

[5] Dover Priory, 409, fol. 80r, *Pronostica Roberti grosteste*, would seem from its opening words, *"Hoc ornamentum . . ."* to be the geomancy ascribed to various authors rather than this treatise by Grosseteste.

[6] Baur, 42.

Man and the stars.

Grosseteste, like most of our Christian authors, exempts man in part by virtue of his free will and rational soul from the control of the stars. One of his brief fragments is entitled "That man is a microcosm" (*Quod homo sit minor mundus*), that is, a replica of the surrounding universe.[2] One of his arguments for the finiteness of this world and of the stars is that all things are made for man and that when he no longer requires the processes of generation and corruption which the movements of the heavens cause, the heaven itself will cease to move and time will be no more.[3] In a treatise on freedom of the will, he follows Augustine in *The City of God* in affirming that the rational soul is sublimer than the stars and in denying that all our actions which seem to be freely willed by us are predictable from the constellations, and that fate prevails as a necessity in all inferiors from the motion of the stars. He admits, however, that the human body is subject to two forces; as part of the world of cause it is changed in many ways by the movements of the stars, but it also is subject to the control of the mind especially in voluntary actions.

Grosseteste's theory of comets.

Grosseteste has an ingenious theory which I do not remember having met elsewhere to explain why comets are signs of great disasters. In his treatise on comets he states that a comet is sublimated fire which has been separated from terrestrial nature and assimilated to celestial nature.[4] The cause of this separation and assimilation by which comets are generated is the virtue of the heavenly bodies. Moreover, each comet has a particular star of its own which draws it as iron is drawn by adamant. This star, even if it is one of the fixed stars, must be related to one of the planets and hence the comet is under some planet also. Grosseteste then further explains that in every earthly object there are incorporated through the action of the celestial bodies particles of a more spiritual sort assimilated to the celestial natures. The generation of a comet, a process in which these fiery or ethereal particles are released from matter and carried up on high, is therefore the first step and sign of a more general release of the spiritual nature and of the consequent corruption of the terrestrial objects and compounds concerned, namely: in the first place, those under the rule of the same planet as the comet in question, and, in the second place, those in the region from which the comet was sublimated.[1] But it is not easy to discern over which region the comet has especial significance of all those regions which are under the same parallel in which it appears, unless, concludes Grosseteste naïvely, it is that region where men are most alarmed by it.

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[1] Baur, 44.
[2] Baur, 59.
[3] Baur, 106.
[4] Baur, 38.

Alchemy.

Grosseteste makes one or two incidental allusions to alchemy which show that he was a believer in the possibility of transmuting metals. He avers that nature intended that all metals should be gold, and that they vary from it only by degrees of imperfection.[2] In another passage [3] he mentions a theory of "the doctors of alchemy" that in each natural object there is, besides the four elements composing it, a fifth essence, unchangeable in itself but alterable after it has descended into inferior bodies. Here again we find a connection between alchemy and astrology.

Other treatises.

It is probable that not all of Grosseteste's astrological writings are included in Baur's edition. He mentions but does not publish a Digby manuscript and another of the thirteenth century in the Bibliothèque Nationale. Both are astronomical or astrological.[4] A fourteenth century manuscript in the British Museum contains a treatise of "Grosthede" on the medicinal virtues of herbs.[5] After the name of each herb the word "Grosthede" is usually added as if the items were extracts from a larger work. The treatise is not included in Baur's edition and is perhaps spurious.

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[1] Baur, 39-40.

[2] *De artibus liberalibus*, Baur, 6.

[3] *De generatione stellarum*, Baur, 36.

[4] Baur, 143.

[5] Sloane 3468, fols. 43v-64r.

Summa philosophiae ascribed to Grosseteste.

Baur includes in his edition of Grosseteste's philosophical works a *Summa philosophiae* which is longer than the other scientific treatises put together but which is probably spurious. The latest authors whom it cites are Alexander of Hales who died before Grosseteste and Albertus Magnus who possibly had written many of his works and made his reputation before 1253 although he lived on until 1280. Its several mentions of Albert are much more likely, however, to have been penned by some younger man than Grosseteste.[1] And unless a passage referring to the death of Simon de Montfort after the appearance of a comet in 1264 [2] is an interpolation, the *Summa* cannot be by Grosseteste, unless in the sense that it represents his teaching or is an incomplete work of his to which someone else later put the finishing touches.

Its contents.

The *Summa* is, like the encyclopedias of Bartholomew of England and Thomas of Cantimpré, in nineteen books,[3] a number perhaps chosen in deference to the seven planets and twelve signs of the zodiac. These books are devoted to the following topics: 1. the rise of philosophy; 2. truth; 3. science; 4. matter; 5. form; 6. virtue; 7. the first cause; 8. the universe—one but not eternal; 9. bodies, space, and vacuum; 10. intelligence and intelligences; 11. the rational soul; 12. the sensitive soul; 13. the vegetative soul; 14. light; 15. the sphere or heavens; 16. nature, universal and particular, and natural virtue; 17. elements and compounds; 18. meteorology; 19. minerals and metals.[4]

Oriental origin of philosophy.

The account of the rise of philosophy includes considerable mention of occult sciences, with which it would seem to have been closely associated from the first.[1] The Chaldeans are called the first famous philosophers. Sem is regarded as the founder of astrology and Cham, whom some identify with Zoroaster, is said to have invented the seven liberal arts. Abraham's instruction of the Egyptians in astrology and arithmetic is next mentioned and then Atlas and his nephew Mercury, and the latter's grandson Trismegistus, of the same name, are spoken of. This second Mercurius Trismegistus was according to Albumasar an illustrious astrologer, preeminent in theology and alchemy and magic and a famous prophet, but according to Augustine he was very worthless (*vanissimus*) in many respects. Long after this Homer revealed philosophy in his stories and Solomon philosophized concerning the nature of vegetables and animals, but in parables, it is believed.

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[1] Baur, 280, 505, 633.

[2] Following the passage in question, 587-88, other events mentioned are in the life of Emperor Frederick II and Louis IX's departure from Aigues-Mortes to Egypt in 1248.

[3] In *Erh Ya*, the earliest Chinese dictionary, the entries are arranged for ready reference under nineteen heads.

[4] These headings are not given in the text but are made up by me to indicate its contents.

Greek men of learning.

After mention of Abrachys, the astrologer of King Nebuchadnezzar, the author then lists the Greek philosophers from Thales to Socrates.[2] The first philosopher in Italy was Pythagoras who had been thoroughly instructed in the science of the stars and magic by the Persians, Chaldeans and Egyptians. In less than a page a good estimate and contrast of Plato and Aristotle is made,[3] and the author tries to explain why until the time of Arabic culture Plato was almost universally preferred to Aristotle among the Greeks and Latins. There follows a list of the learned Greeks: Empedocles, Heraclitus, Hippocrates, Euclid, Archimedes, and various orators, astronomers, astrologers, and naturalists (*naturales*) concluding with "Callisthenes the famous alchemist." [4]

Arabs and medieval Christians.

Among the Arabs three groups are distinguished of philosophers, *mathematici* or astrologers—among whom we are amazed to find Julius Firmicus listed, and medical writers.[5] Thebit also is classed with the Arabs, but Plato of Tivoli, Costa ben Luca, Algazel, Gundissalinus, Constantinus, Theophilus Macer, and Philaretus are distinguished as Christian, and both Rabbi Moses as Hebrews.

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[1] I, 1, (Baur, 275-77). For the origins of "mathematical science" see also XV, 12, (Baur, 561).

[2] I, 2, (Baur, 277).

[3] I, 3, (Baur, 278).

[4] I, 4, (Baur, 278-79).

[5] I, 6, (Baur, 279).

Ancient and modern science compared.

Approaching his own time the author says that there are many other men whose excellent works of philosophy he has inspected but of whose names he is ignorant or has his reasons for keeping silent about.[1] He does, however, name John the Peripatetic and Alfred, and still more recently Alexander the Minorite and Albert of Cologne, the friar preacher, as eminent philosophers and yet not to be considered authorities. The author nevertheless has no uncritical veneration for the learned men of the past. He thinks that with the exception of the Peripatetics very few of them had a complete or correct knowledge of the principles of nature and causes of natural phenomena or concerning the transmutation of the elements and the composition of physical bodies.[2] Compared with moderns he finds their comprehension slight, except as they had fewer problems to occupy them and got results by concentrating for a long time on these. But he can think of no one among them except Boethius who was not guilty of some erroneous opinion. This attitude, however, is perhaps more owing to Christian prejudice than scientific superiority on our author's part.

Criticism of Aristotle and the Arabic text..

Even Aristotle does not escape criticism. We are told that we should not accept his statement concerning the number of movers of the heavenly spheres, for, as Avicenna and Rabbi Moses have pointed out, the science of astronomy was little developed in his time.[3] Nor are the Arabian commentators upon Aristotle left uncensured. It is said that some of the works of Aristotle in their present form smack more of Arabic loquacity than of Greek eloquence or the Aristotelian style, and that, especially in the Arabic text, interpolations and additions and alterations have been made involving patent anachronisms. Probably there have also been corresponding omissions.[4] These criticisms of the Arabic text of Aristotle remind us of those which Roger Bacon said Grosseteste made.

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[1] Baur, 280.

[2] I, 7, (Baur, 281).

[3] X, 25, (Baur, 457).

[4] I, 10, (Baur, 283): see too XV, 5, (Baur, 551).

Use of the word "modern."

The author of this *Summa* is quite fond of employing the word "modern" which we heard him use above. He also tells how "Ptolemy, and other more modern *mathematici*" introduce epicycles in the orbits of the planets to save appearances, but have not fully determined "whether it is really so."[1] He also speaks of "Avenalpetras and the more modern Arabs" and calls Albertus Magnus "the most famous of the more modern theologians."[2]

Theology, philosophy, and science; speculative and experimental.

It is rather outside the limits of our investigation, but I cannot refrain from noting the *Summa's* division of theologians into three classes: first, those who are original and have been made saints by the pope; second, those who are original and have not been sainted; third, the unoriginal minds who compile *Summae* from the works of the other two classes.[3] The author believes that theology may utilize philosophy to refute heretics but that it must beware of making philosophy its chief end and should use theological terms as far as it can.[4] Later he states that there are eight celestial spheres, according to the philosophers, nine according to the theologians who include the waters above the firmament as one.[5] The author divides science into theoretical or speculative and practical or operative. He also has a touch of experimental science, asserting that very many experiences have proved that water will harden into stone,[6] that the rules of genethlialogy and the predictions of astrologers are based upon the many specific cases observed and classified from experience by past astrologers,[7] that many experiences in his own age—some of which he presently mentions—have shown that terrible events always follow the appearance of a comet,[1] and that the alchemists had learned from many experiments that metals can be transmuted.

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[1] XV, 14, (Baur, 565), *Ptolemaeus etiam, ceterique moderniores mathematici:* see also XV, 16, (Baur, 567), *nonnullisque etiam modernioribus mathematicis.*

[2] XV, 5 (Baur, 551): XII, 17 (Baur, 505).

[3] I, 11, (Baur, 284-85).

[4] I, 13, (Baur, 288).

[5] XV, 12, (Baur, 560).

[6] XIX, 2, (Baur, 627).

[7] XV, 30, (Baur, 588).

Astrology.

This favoring attitude toward astrology and alchemy is about all that there is left for us to notice in the *Summa.* The author thinks that no one has ever adequately treated the virtues appropriate to each planet, but quotes Rabbi Moses and Albumasar somewhat on this point.[2] He has no difficulty in believing simultaneously in freedom of the will and genethlialogy.[3] He also cites the passage in Albumasar concerning the astrological prediction of the virgin birth of Jesus Christ.[4] In discussing comets, instead of attempting to explain their signifying disaster to whole regions naturally, as we heard Grosseteste do in his treatise on comets, the author of the *Summa* holds that "they appear of necessity by the will of God alone, not by chance or nature, but by the ministry of intelligences." [5] This was also the case with the star seen at Christ's nativity. It may be, however, that this entire passage about comets and other astrological matters is an interpolation in the *Summa,* since it is in it that the mention of the date 1264 occurs to which we before alluded. The writer then goes on to say that his master, who was "most skilled in natural and mathematical science and most perfect in theology and most holy in life and religion," taught him that Noah's flood was necessitated by a constellation which God had foreordained for the wickedness of the then world.[6] This, too, is perhaps a sign of an addition by some disciple of Grosseteste.

Occult virtue and alchemy.

The author of the *Summa* believes in occult virtue in nature and attributes it to the stars.[7] He accepts Albertus Magnus's explanation of the marvelous virtues of gems as due to celestial influence.[8] He believes that metals are generated in the earth by the same force and are seven in number according to the seven planets, and thinks that this process can be simulated by alchemy.[1] In discussing that subject Hermes is his chief authority. The *Summa* terminates by explaining the superiority of steel to iron and listing various salts.[2]

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[1] XV, 29, (Baur, 586).

[2] XV, 28, Baur, 583. "De effectibus planetarum famossisimis et de eorum qualitatibus."

[3] XV, 30, (Baur, 588-89).

[4] I, 9, (Baur, 282).

[5] XV, 29, (Baur, 586).

[6] Baur, 589.

[7] XVI, 5, (Baur, 594).

[8] XIX, 6, 7, (Baur, 633-34).

Brother Giles on the comet of 1264.

Since we have mentioned the comet of 1264, we may note farther that it was the occasion of a treatise by Brother Giles of the Order of Dominicans, on the essence, motion, and signification of comets,[3] in which he cites Grosseteste *De iudiciis* and alludes to the death of Pope Urban IV in that year. The comet was seen in the kingdom of France from mid-July to October and "stupefied the minds of many."

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[1] XIX, 8-9 and 13, (Baur, 635-36, and 641).

[2] XIX, 13-14, (Baur, 641-3).

[3] Pembroke 227, 14-15th century, fol. 250. Inc. tract. fratris Egidii ordinis fratrum predicatorum de essencia motu et significacione cometarum. Quoniam multorum animos andivi stupefactos . . . occasione . . . stelle caudate . . . que apparuit in regno francie . . . a 19° kal. aug. usque 5° non. oct. a. d. 1264." CUL 2022 (Kk. IV. 7) 15th century, fols. 91-96r. Fratris Egidii de cometis.

APPENDIX I

THE PERSPECTIVE OR OPTICS OF WITELO

Emphasis upon experimental method.

In the work on the science of Perspective or Optics, which was composed later in the thirteenth century by Witelo [1] who calls himself a son of Thuringians and Poles,[2] we meet again with much the same attitude as that shown in the corresponding works of Grosseteste. The experimental character of the subject is repeatedly emphasized;[3] we hear much of experimenting with instruments;[4] and such words as "experimenter" and "experimentation" are used.[5] Similar passages, however, are also found in Witelo's main source, the work of the Arab Alhazen on the same subject.[6] But Witelo also encourages his readers to go farther and experiment for themselves, assuring them that "experience more than books will teach the varied possibilities of images" [7] from mirrors, suggesting, "Let then the ingenuity of moderns and men of the future add what it shall please,"[1] and again affirming in the case of burning-glasses, "But in experimentation with these too there is the greatest latitude which we leave to those who are curious in such matters."[2]

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[1] I have used the edition of 1572, *Vitellionis Thurinopoloni Opticae libri decem,* ed. F. Risner, Basel, 1572, where the text of Witelo, occupying 474 pages, is preceded by a Latin translation of Alhazen in 288 pages. The chief modern study on Witelo is C. Baeumker, *Witelo, ein Philosoph und Naturforscher des XIII Jahrhunderts,* Münster, 1906.

[2] In his preface to William of Moerbeke. "Veritatis amatori fratri Guilielmo de Morbeta vitello filius thuringorum et polonorum. . . ."

[3] II, 43, "Experimentaliter etiam et hoc propositum theorema potest declarari . . .;" II, 46, "Sed et id quod nunc proponitur potest experimentaliter declarari . . .;" X, 43, "Hoc autem potest sic experimento declarari . . ." etc.

[4] II, 42, "Huius propositionis probatio plus experientiae instrumentorum innititur quam alteri demonstrationum. Cum ergo quis experiri voluerit. . . ." II, 44, "Instrumentaliter similiter experientia propositum theorema potest declarari. . . ." II, 45, "Hoc quod nunc hic proponitur est conformiter prioribus per instrumentalem experientiam declarandum. . . ." II, 47, "Illud quod particularibus experientiis hactenus instrumentaliter probatum est naturali demonstratione. . intendimus. . adiuvare." . . .

[5] See especially IV, 108.

[6] Compare Witelo IV, 108 and X, 5 with Alhazen III, 12 and VII, 10.

[7] IX, 35, "et plus experientia quam scriptura docebit imaginum diversitates. . . ."

Occult and astral virtue.

Witelo also resembles Grosseteste in his favorable attitude toward astrology and the conception of the radiation of virtue. Already in his preface to William of Moerbeke he speaks of that "influence of divine virtues which is made in marvelous wise in inferior bodies through the virtues of superior bodies,"[3] of that "divine light" which is "the sensible medium of corporal influences,"[4] marvelously assimilating and connecting inferior bodies with superior bodies, while he compares the influence of the celestial constellations upon subject bodies to the process of reflection in a mirror.[5] At the beginning of his tenth book, stating that the virtues of natural forms increased by refraction act more strongly, he adds that universally an increase of the virtue of the rays of the stars or of other forms at the same natural point or about the same point results in stronger action. Such passages suggest that perspective or optic was studied not only for its own sake but for its supposed analogy to the operation of occult and astral virtue. Indeed in his preface he represents William of Moerbeke as versed in such occult research,[6] and William translated not only astrological treatises but also probably the so-called *Ptolemaei de speculis* which is really Hero's *Catoptrica*. Baeumker believes that Witelo for his part was strongly affected by the metaphysical theory in favor with the Neo-Platonists and Gnostics of primitive light as the origin of intelligence, space, and so on.

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[1] IX, 35, "Ingenium vero modernorum et futurorum addat quod libuerit. . . ."

[2] X, 48, "Sed et in horum experimentatione est maxima latitudo quam relinquimus ad talia curiosis."

[3] ". . . divinarum virtutum influentiam inferioribus rebus corporalibus per virtutes corporales superiores modo mirabili fieri . . ."

[4] "Corporalium vero influentiarum divinum lumen sensibile est medium."

[5] "Et dum sic per figuras speculorum discurrimus celestes et omnes naturales influentias a subiectis corporibus sub quodam reflexionis modo ad alia corpora declaramus."

[6] "Placuit tibi in illius rei occulta indagine versari," in the 1572 edition; but in Quetif-Echard (1719) I, 389, "in illius rei occultae indagine."

Marvelous effects.

In Witelo's work may also be noticed something of that element of thaumaturgy which we noted in Hero of Alexandria. Thus in his eighth book on concave mirrors he speaks of the "marvelous diffusion of natural forms and the multiform deception of the visions beheld," while in the ninth book on burning glasses we are promised the production of astonishing effects. But as a rule Witelo's presentation of his subject is geometrical rather than sensational, and his first book, not paralleled in Alhazen, is a geometry of 137 propositions as a basis for the ensuing "universal axioms of this science." As we have seen, however, Witelo employs the experimental as well as the mathematical method and instruments as well as theorems.

Further characteristics.

Unlike Grosseteste, Witelo regards vision by extramission of rays from the eye as impossible,[1] wherein he follows Alhazen. Of magnifying lenses he seems to display only a theoretical knowledge,[2] and to add little to Alhazen on this point and less to Grosseteste. In general, however, he is believed by collecting the tradition of the past and filling in the gaps therein to have made the whole subject clearer to the Latin world and to have produced a work which served for several centuries as an excellent text book in the field of optical science.[3] Its original portion consists especially of observations made by the author at Padua and Viterbo,[4] which latter town was also the scene of several of William of Moerbeke's translations. The Perspective was probably dedicated to him about 1270.[5]

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[1] III, 5-6.

[2] X, 43 *et seq.*

[3] Baeumker (1908), p. 237.

[4] *Ibid.*, p. 224.

[5] Such is Baeumker's opinion; why Dr. Charles Singer in his lecture on "Science" in *Medieval Contributions to Modern Civilisation,* (p. 140), speaks of Witelo as "the earliest" of the group of forward-looking scientific thinkers which culminated in Roger Bacon and dates him "(c. 1250)" I do not know.

CHAPTER LVI

VINCENT OF BEAUVAIS

The *Speculum Maius*—Events of his life—Was the *Speculum naturale* finished in 1250?—Order of the three Mirrors—Chronological relation to Albert and Aquinas—General character of the *Speculum naturale*—Vincent's method of compilation—Use of Pliny and Aristotle—More recent authorities—Credulity concerning the barnacle birds—A sign of his scientific inferiority—Demons, magic, and superstition—Divination from dreams—The stars—Their influence—Virtues of gems—A chapter on the jasper—Alchemy—Virtues of plants—Animals—The tree of life and the bodies of the damned—Who sinned the more, Adam or Eve?—Classification of the sciences—Concluding estimate of the *Speculum naturale.*

The *Speculum Maius.*

Of medieval encyclopedists and compilers Vincent of Beauvais may be ranked as chief by reason of his *Speculum Maius,* which really consists of three voluminous "Mirrors," the *Speculum naturale,* with which we shall be chiefly concerned,[1] and the *Speculum doctrinale* and *Speculum historiale.* The *Speculum morale,* once attributed to him, has been shown to be a later production. The *Speculum naturale* may be regarded as capping the series begun with Neckam's *De naturis rerum* and continued by Thomas of Cantimpré's *De natura rerum* and Bartholomew of England's *De proprietatibus rerum.* The *Mirror of History* is a world chronicle written from the Christian standpoint. The *Mirror of Doc-*

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[1] Our two chief accounts of Vincent's life and works are still the long article by Daunou in HL XVIII (1835), 449-519, and M. l'Abbé J. B. Bourgeat, *Études sur Vincent de Beauvais,* Paris, 1856. A little more recent is E. Boutaric, *Vincent de Beauvais et la Connaissance de l'antiquité classique au XIIIe siècle,* in *Revue des Questions Historiques,* XVII (1875), 5-57.

I have used the following edition of the *Mirror of Nature: Vincentius Bellovacensis, Speculum naturale, sine nota* (*Nurembergae, Anth. Koburger,* 1485), in two huge folio volumes. Later editions than this are apt to be very faulty. I have used an edition of the *Speculum doctrinale* of 1472 (?) and one of the *Speculum historiale* of 1473.

trine is not merely concerned with doctrine in the theological sense but with all fields of art and learning, industry and society, beginning with a discussion of schools of philosophy and educational method and a dictionary of some 3200 words, and running through grammar, logic, rhetoric, poetics, monastic and economic and political institutions, the useful and military arts, medicine, physics, and natural philosophy, mathematics and metaphysics, and finally reaching theology in its seventeenth and last book. Indeed, Vincent himself well described it as concerned with "all arts," as the other two Mirrors reflect "all things" and "all times." [1] It is considerably briefer than the *Mirror of Nature* which contains almost twice as many books.

Events of his life.

Little is known of Vincent's life and the years of his birth and death are uncertain. He speaks of himself as "Vincent of Beauvais of the Order of Preachers," and in 1246 was a sub-prior of the Dominican monastery at Beauvais. Like another learned friar of his time, Roger Bacon, he speaks of laborious duties which interrupted his literary activities and forced him to employ copyists. Probably the most important external circumstance of his career was his connection with the royal family of St. Louis. Although a Dominican, Vincent held the post of reader in the Cistercian abbey of Royaumont which Louis had founded in 1228. Vincent seems to have served Louis IX in the triple capacity of royal librarian, chaplain, and tutor of the king's children. His treatise *On the Education of the Royal Children* was composed at some time after the return of St. Louis from the Holy Land in 1254, and his *Consolatory Letter* dealt with the death of Prince Louis in 1260. The date 1264, often mentioned as that of Vincent's death, rests on the statement of Louis à Valleoleti who wrote in the early fifteenth century. Ptolemy of Lucca who wrote a century nearer to Vincent's time cites him concerning the three year vacancy in the papacy following the death of Clement IV, which would bring the completion of the *Speculum historiale* down to 1271 at least, but Daunou showed that this citation was incorrect and that the passage in question was from Martin of Poland, not Vincent of Beauvais. This is perhaps also the case with another passage in Ptolemy of Lucca which Daunou failed to note and which says, "Historians in general state, but Vincent in particular writes" of a comet which portended the death of Pope Urban IV in 1264. Although the duration of the comet was three months, the pope sickened as soon as it appeared and died on the very day that it disappeared.[1] If the citation is from Vincent, he must have lived beyond 1264.

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[1] Prologue, cap. 17; cited HL XVIII, 475.

Was the *Speculum naturale* finished in 1250?

It has been customary to give 1250 as the precise date for the completion of the *Speculum naturale*, because its last book, which is geographical and historical, states that it will bring the history of the world down to the present year, 1250. Valentin Rose accepted this date so confidently as to argue on the basis of it that, because Vincent did not cite the work of Albertus Magnus on minerals,[2] that treatise was not written until after 1250. But that such statements of the current year in Vincent's works cannot be relied upon too implicitly is shown in his *Mirror of History*. From the list of popes given in its eighth book we should infer that it was composed in 1244 or 1245, since it speaks of Innocent IV as having now sat on the throne for two years; and again the closing chapter of its thirty-first [3] book states that the author has brought the history of the sixth age of the world down to the current year, that is, the eighteenth of Louis IX and the the second of Innocent IV and the thirty-fourth of Frederick II. But other events are mentioned which happened in 1250 and 1254.[4]

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[1] Ptolemy of Lucca XXII, 26, in Muratori, X, 1155. I unfortunately omitted to verify the citation from the *Speculum historiale,* at the time that I had access to that work.

[2] As a matter of fact Vincent cites Albert concerning the odors of certain metals (V, 106) without naming any book.

[3] Or thirty-second book in some editions. As a matter of fact the date 1244-1245 is also indicated at the close of the preceding book.

[4] In book XXXII, edition of 1473, he mentions the death of Edmund Rich, archbishop of Canterbury, in 1247; and (cap. 102) tells how St. Louis in 1250 sent his brothers Alphonse of Poitou

Order of the three Mirrors.

It is also difficult to determine the order in which the three Mirrors were completed. Daunou assumed that the *Speculum naturale* was finished first, and that the *Speculum doctrinale* treated again of some topics which had already been discussed in the other. He also placed the *Speculum historiale* later than the *Mirror of Nature,* believing that it was published at some time after 1254 rather than ten years earlier, and pointing out that in its ninth book Vincent mentioned having used Pliny's *Natural History* in his *Speculum naturale.* On the other hand, the revised edition of Potthast's *Wegweiser* regards the *Mirror of History* as completed about 1244 before the *Mirror of Nature.* As an intermediate work it mentions *Memoriale omnium temporum,* an extract in eighty chapters made by Vincent himself from the *Speculum historiale.* This extract was then embodied in the last book of the *Speculum naturale,* where an account of the years 1242-1250 was added to it. And in the last chapter of the *Speculum naturale,* where the coming of antichrist and the last judgment are discussed, we are told that these matters are more fully treated at the close of the *Speculum historiale.* Thus we have both the *Mirror of History* looking back on the *Mirror of Nature* as an earlier work, and *vice versa.* Thus we apparently have to do with a revised edition of one or both of the works, or with later additions and interpolations which a study of the manuscripts would be necessary to unravel, although very likely it would fail to do so. One might hazard the conjecture that the *Mirror of History* was first issued in 1244, as it says, and that this edition was the one cited in the *Mirror of Nature;* that after 1254 a revised edition of the *Mirror of History* was issued and that in this the *Speculum naturale* was referred to. There are further objections even to this view, however, as we shall presently see.

and Charles of Anjou back to console their mother; while in caps. 103-4 we read of Peter of Milan being canonized by Innocent IV in the tenth year of his pontificate or about 1254.

Chronological relation to Albert and Aquinas.

If the *Speculum naturale* as we have it was completed by 1250, it would aid us in dating works of Albertus Magnus and Aquinas which it cites. Vincent cites Albert a great deal, especially for the Aristotelian psychology, often without definite mention of the title of the work cited, but sometimes such titles are mentioned as *De anima, De sensu et sensato, De somno et vigilia, De animalibus.*[1] Evidently Albert had already completed many of his commentaries upon and elaborations of the Aristotelian philosophy, and had made an established reputation for himself. It is quite possible that this had been already accomplished by 1250, since, while Albert lived on until 1280, he was then an old man. But what is surprising to find in a work written in 1250 are Vincent's citations of Thomas Aquinas on such questions as "How an angel instructs the soul?" and "What prophecy is?"[2] In 1250 Aquinas would have been only twenty-three and would scarcely have attained the rank of an authority upon advanced theological problems of this sort, since he did not receive his doctorate in theology, precocious as he was, until 1257. Either then these citations are later interpolations, or Vincent did not complete the *Speculum naturale* in 1250. But this problem again calls for an examination of the earliest manuscripts.

General character of the *Speculum naturale.*

The *Speculum naturale* may be described as a sort of over-grown *Hexaemeron;* indeed, in some of the manuscripts it is entitled, *Speculum in Hexemeron libris 32, ex dictis innumerabilium tam christianorum quam gentilium.*[3] That is to say, its consideration of nature follows the order of the six days of creation. But the mass of scientific data is so voluminous as to obscure this underlying Biblical plan, and the work is divided not into six books, but thirty-two and a prologue, or thirty-three in all. The work is, however, more marked by a theological aim, tone, and interest than others that we have considered or shall consider. This is not quite so noticeable as in the *Speculum historiale,* described by Daunou as "a work planned and executed in an essentially theological spirit,"[1] and one of whose four books on the twelfth century consists entirely of extracts from the writings of St. Bernard. But as the prologue of the *Mirror of Nature* ranks the philosophers and doctors of the Gentiles as of the third and lowest grade of authority, as its next book discusses the Trinity and angels as well as the universe, and the third deals with demons as well as elements and atoms, so its twenty-fourth book is largely concerned with the soul and its immortality, the thirtieth with the seventh day of rest and such topics as fate and providence, sin and penitence, and the thirty-first with Paradise, the creation and fall of man, marriage, and so on. We have had other writers begin with the Trinity and angels and demons but thereafter deal more exclusively with purely physical phenomena. We have seen other writers start out with the professed object of explaining the Scriptures but end by discussing nature in a purely scientific way. Vincent, on the other hand, sets out to compile a *Mirror of History* or a *Mirror of Nature* but cannot keep his mind off such themes as the fall of man and the last judgment.

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[1] Vincent does not seem to know or use Albert's *De vegetabilibus et plantis* in seven books, citing instead apparently Alfred of England's translation of the two books of the *De plantis.* I doubt, however, if Vincent's failure to cite a work by Albertus Magnus can be taken as sure proof that the work had not yet been written. Vincent was far from noting or including everything that was known in his time or had been written before, although some lazy investigators of the past have seen fit to assume that his work adequately depicted the entirety of medieval natural science.

[2] *Spec. nat.,* XXVII, 74 and 82; see also 101.

[3] HL XVIII, 485.

Vincent's method of compilation.

Vincent also adheres rather more strictly to his professed rôle of a mere compiler than some of our other medieval writers. He says that he will distinguish his own statements by the word *Actor* or *Auctor,* author or editor, and such passages are of minor importance and make little or no new contribution to scientific knowledge. His superiority to other medieval compilers or encyclopedists consists almost entirely in the fact that he has had access to a larger library and has made longer and more numerous excerpts from his authorities than they. As a rule he does not attempt to reconcile conflicting statements in the authorities, warning his readers in the prologue that he is a mere excerptor and not to be held responsible for such inconsistencies. Indeed, he is to such an extent a mere excerptor that it is perhaps more important to note the authors whom he uses [1] than the subject-matter which he takes from them and which we have already been over in large measure, since we have already considered separately many of his main sources.

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[1] HL XVIII, 504.

Use of Pliny and Aristotle.

Vincent is easily indebted to Pliny, with whose entire *Natural* History he seems acquainted,[2] more than to any other single source and the *Speculum naturale* is as much an imitation of it as a development from patristic *Hexaemerons.* Another constant reliance is Isidore, who of course in his turn had used Pliny extensively. Aristotle and various Arabian authorities—Rasis, Avicenna, Albumasar, Averroes—are frequently cited, but sometimes at least indirectly through Albertus Magnus. In his preface Vincent apologizes for often giving Aristotle's views not in his own words but in transposed order for the sake of condensation and clearness. Incidentally he reveals that he had the service of assistants in compiling his encyclopedia, since he states that he has not made these renditions of Aristotle himself but that they have been "excerpted by certain brothers." At the same time he shows how familiar the wording of Aristotle's text had become by his time and how precise the standards of medieval scholarship were in some respects, when he adds that there are some scholars who will not tolerate the alteration of one iota or the order of a single word of the authority.[1]

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[1] His use of classical authors has already been treated by E. Boutaric, *Vincent de Beauvais et la Connaisance de l'Antiquité classique au XIIIe siècle,* in *Revue des Questions Historiques,* XVII (1875), 5-57; also printed separately.

Fabricius, *Bibliotheca Graeca,* 1718-1728, XIV, 107-25, gives a list of about 350 names of authors or titles cited in the *Speculum naturale;* of these 254 are repeated by Daunou in HL XVIII, 483-4.

Unfortunately, at least in the printed edition of 1485, it is often not clear where quotations begin and end, or to just what passages the names of the authorities who are cited apply.

[2] Daunou (HL XVIII, 486) asserts that Vincent had better MSS of Pliny than Albertus Magnus had.

More recent authorities.

Vincent is also not ashamed "to learn from modern doctors"[2] and employs many works of his medieval Latin predecessors from Constantinus Africanus, whom he cites a great deal as Bartholomew did, to Albertus Magnus and perhaps Thomas Aquinas. He makes some use of the *Natural Questions* of Adelard of Bath, which treatise he once cites as *"Adelardus ad nepotem,"*[3] and for matters astronomical he makes much use of the *De philosophia* or *Dragmaticon* of William of Conches. He also repeats its *locus classicus* concerning the waters above the firmament where the view of Bede is rejected for "the more probable opinion of the moderns in this matter."[4]

Credulity concerning barnacle birds.

While Vincent shows a wide and commendable acquaintance not only with a large number of names of authors and titles, but in many cases with a part or the whole of the contents of the books themselves, it sometimes appears that he has not got all that he might have from the authority in question, and he sometimes does not display the soundest of judgment in what he includes and what he omits in making his selections. The case of the barnacle birds may serve as an illustration. Now Vincent cites the work of Albertus Magnus on animals concerning falcons in the very same seventeenth book in which this chapter on the barnacle birds occurs. With his broad bibliographical attainments Vincent should have realized the worth of Albert's work and should have imbibed some of its sceptical and critical attitude toward stories of strange and outlandish animals. Albert had branded as liars those who said that birds were born from trees, hanging from the trunk and branches and being nourished by the sap beneath the bark, or that birds were generated from driftwood at sea, and that no one had ever seen such birds lay eggs or have sexual intercourse. Albert and many of his associates had seen them doing both and feeding their young.[1] Yet Vincent continues to discuss these barnacle birds most credulously. They feed on driftwood. At birth they are naked but gradually grow feathers and float through the sea hanging to the driftwood by their beaks until they come to maturity and bestir themselves and break away. "And we ourselves have seen many of them and trustworthy men have testified that they have seen them hanging thus." Jacques de Vitry tells of them in his *Oriental History:* "It is further to be noted that they do not hang in the tops of trees but on the bark of the boughs and trunks. And they grow on the sap of the tree and the infusion of dew until they have feathers and strength and break off from the bark. It may be said with certainty of these birds that in our part of the world around Germany they neither generate by sexual concourse nor are generated. Nor has any man among us ever seen their sexual congress. Consequently some Christians in our time in those places where birds of this sort abound are accustomed to eat their flesh in Lent. But Pope Innocent III in the general council at the Lateran forbade them to do this any more."[2] After stating that the barnacle birds eat herbs and grain like geese and cannot go for long without drink, Vincent cites a "Philosopher," but it is not clear whether as authority for the foregoing statements or the ensuing assertion that the barnacle bird which is born from trees is found also in certain parts of Flanders.[3] "Philosopher" in this case can therefore scarcely be Aristotle. Despite what was said of the bird's thirst, it is now added that like trees it has no superfluity.

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[1] *Spec. nat.*, I, 10, *Apologia de modo excerpendi de quibusdam libris Arestotelis.*

[2] *Ibid.*, I, 3.

[3] *Ibid.*, VII, 6-7.

[4] *Ibid.*, IV, 93-4.

A sign of his scientific inferiority.

Perhaps Vincent had read but little of Albert's work on animals; possibly the citations of it in the *Speculum naturale* are later interpolations; but in any case the passage suggests a difference in scientific attitude between the two men. It should be added, however, in Vincent's favor that his descriptions of fish were in Cuvier's opinion more precise and correct than those of Albert.[1] But in general it seems to me that he was neither the personal observer of nature that Albert was, nor did he possess as much scientific discrimination. This defect is bound to affect his whole selection of material and use of authorities, and, together with his somewhat excessive theological bias, makes his compilation, extensive as it is, scarcely representative of medieval natural science at its best. At the same time we see that in the very process of excerpting he gives his compilation a certain character and tone of its own. It will therefore be well, in view of its widespread and enduring influence, attested by numerous manuscripts and printed editions, to give some attention to its contents, and see what attitude it reflects on the subjects of magic, astrology, divination from dreams, and occult virtue in nature.

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[1] *De animalibus,* XXIII, 14. Frederick II, in his *De arte venandi cum avibus,* was equally sceptical and based his disbelief on personal investigation: Haskins in EHR XXXVI (1921) 351.

[2] *Spec. nat.,* XVII, 40.

[3] This treatment and the previous quotation sound rather like Thomas of Cantimpré, but I did not notice such a passage in his *De natura rerum* at the time that I had access to MSS of it, although at that time I was not searching for this particular topic.

Demons, magic, and superstition.

Vincent's mentions of magic[2] are incidental to his discussion of demons and the marvels, transformations, and divination which they are able to work. On these points he repeats the views of Augustine, Peter Lombard, and other like-minded ecclesiastical authorities, and we need not dwell upon them further, except to note that he makes the demons inhabit the lower and misty air, and that his citation of *The Golden Ass* of Apuleius is probably indirect through Augustine. We should also note, however, a passage in the *Mirror of Doctrine*[3] which seems to be largely derived from the *Summa* of a "brother William," which may possibly be the *De universo* of William of Auvergne, although he does not seem to have been a friar. The passage states that incantations may be used to enchant the sick or children or animals, provided no superstitious practice which the church has prohibited is involved, and only licit prayers, adjurations, and such symbols as the sign of the cross are used. Perhaps the practice of hypnotism is involved here. Vincent believes that men and women who introduce many useless and superstitious ceremonies should be forbidden to continue these practices, which should be confined to priests and to laymen and women of excellent life and proved discretion. But he does not object to employment of the divine symbol in plucking an herb or to writing the Lord's prayer on a scroll and placing it near the patient.

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[1] *Hist. des Poissons,* I, 35; cited HL XVIII, 489.

[2] *Spec. nat.,* III, 101-11; I, 19; V, 114; XXXII, 122.

[3] *Spec. doctr.,* X, 121.

Divination from dreams.

In his discussion of dreams and their significance Vincent combines such varied authorities as Aristotle, Avicenna, Albert, Aquinas, and Pope Gregory the Great, who accounted for dreams by a full or empty stomach, the thoughts of the dreamer, the illusions of demons, and the revelations of angels. While recognizing with the Bible that dreams make many err, Vincent agrees "with the saints and prophets that dreams frequently signify something concerning the future." Dreams are powerfully affected by the motion of the stars in the sky, which is scarcely noticed when we are awake but is manifest in sleep. Dispositions, too, on the part of the sleeper make themselves felt in dreams which are not observed in waking hours, a medieval statement of the Freudian theory. Dreams are not causes but simply signs of the future. Since the events which they forecast are not yet in existence, they obviously cannot portray them plainly but suggest them obscurely in a manner requiring interpretation. Thus to dream of fire is a sign of future anger, to see a great foul mouth in a dream indicates a false criminal accusation, to dream of a scorpion portends secret detraction. It is commonly stated by philosophers that the signification of a dream varies as it occurs at the full moon or the new moon or in the sunshine, and also according to the positions of the planets in the signs.[1]

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[1] The passages cited will be found in *Spec. nat.*, XXVII, 52-61, but I have altered Vincent's order of presentation.

The stars.

From the influence of the stars upon dreams we may next turn to Vincent's attitude toward astrology in general. It is a mixture of passages from church fathers against the errors of the genethlialogists and *mathematici,* and of passages from the philosophers, ancient and recent, affirming the control of the stars over the world of nature. Vincent, however, attempts to combine and reconcile these, and makes his own standpoint fairly evident. He holds that the brief, vague utterances of Aristotle whence the commentators have inferred that the stars are alive do not necessarily imply this.[1] They are nevertheless superior in certain ways to all inferior life, and are of an unalterable and incorruptible nature.[2] Vincent undertakes to reconcile the assertion of holy doctors that the heavens neither have souls nor are animals with the doctrines of the philosophers.[3] He holds that there are Intelligences in the spheres of the heavens who serve the First Cause or Mover and that, although the saints abhor giving these the name of souls, yet they concede that intelligences or angels move the heavens and the stars at the nod of God.

Their influence.

From sages and men of old Vincent reiterates such doctrine as that "the movement of the heavens and superior bodies is the cause of all natural motions" and of generation and corruption; that there is no plant on earth which does not have its controlling star; and that "all things which are renewed in the inferior world, except such as are caused by the superior form of our reason, have their efficient causes in the inalterable and incorruptible superior world." [4] Vincent devotes much of his sixteenth book to astrological technique, detailing the good and evil qualities of the planets, and describing their houses, exaltations, *triplicitates, termini, facies,* and their virtues in the different signs of the zodiac.[5] Like Bartholomew he also reproduces Constantinus Africanus' account of the control by the planets of the formation of the human foetus in the womb.[1] In a later book [2] he repeats the views of Albumasar and an unnamed astrologer concerning the influence of the sun and other planets in human generation. Against their control of such matters as sex, however, Vincent cites the authority of Augustine and some physiological arguments. He further warns us not to subject human reason and free will to fatal necessity of the constellations, citing such authorities as Gregory's homily for epiphany and Chrysostom's sixth homily on Matthew anent the Magi and the star, and repeating such time-worn and time-honored arguments as the case of Esau and Jacob or the fact that in fishless inland provinces men are born under the sign Pisces.[3] Vincent repeats the general medieval belief that comets signify pestilence, famine, or war.[4] His discussion of Egyptian days we have considered elsewhere. He seems to accept the efficacy of astrological images, repeating the attribution of medicinal virtue and influence on human character to "stones on which you find engraved Aries or Leo or Sagittarius," [5] and citing Thetel,[6] perhaps indirectly through Thomas of Cantimpré, concerning the virtues of engraved gems. But to the virtues of gems let us turn.

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[1] *Spec. nat.,* XXV, 42-44.

[2] *Ibid.,* cap. 45.

[3] *Ibid.,* IV, 26-27.

[4] *Ibid.,* IV, 37 and 83; XVI, 43.

[5] *Ibid.,* XVI, 27-42.

Virtues of gems.

For the virtues of gems Vincent combines authorities from the Pseudo-Aristotle and Pliny down to Arnold of Saxony and Thomas of Cantimpré. The extreme powers credited to gems by the Magi and Marbod play a prominent part in his ninth book. Selecting by lot five [7] out of seventy odd chapters we read that the agate averts storms and thunderbolts, gives victory in war, routs venomous animals, aids the sight, slakes the thirst, and promotes fidelity. The *balagius* stimulates conjugal affection, burns the right hand grasping it, strengthens weak eyes if one drinks water in which it has lain, and protects one against enemies. Coral checks hemorrhage, reduces corpulence, draws harmful humors from the eye, cures ulcers, and benefits heart, intestines, and spleen. Suspended over the mouth it stops stomachache; suspended from the neck it prevents epileptic fits. Suspended from trees or sown with seed it protects the fruit or crops from hail storms. Decayed teeth are filled with it in order to extract them, and it is terrible to demons because it is so often found in the form of the cross. The gem heliotrope makes one invincible in battle and invisible, if it is combined with the herb of the same name and certain incantations. It makes water boil, reddens the sun, prevents loss of blood, is an antidote to poison, assures its bearer long life, and aids in prediction of the future.

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[1] *Spec. nat.*, XVI, 49.
[2] *Ibid.*, XXXII, 38-39.
[3] *Ibid.*, XVI, 50-51.
[4] *Ibid.*, XVI, 58.
[5] *Ibid.*, IX, 35.
[6] *Ibid.*, IX, 77.
[7] Caps. 37, 47, 57, 67, 77.

A chapter on the jasper.

The chapter on the jasper is a good example of Vincent's method of combining excerpts from varied authors. First he cites the monkish chronicler Helinandus who died in 1227 to the effect that the jasper worn chastely dispels fever and dropsy, and that application of it aids child-birth. The *Lapidary* of the pseudo-Aristotle repeats this last assertion and adds that the gem clarifies the human sight and checks bleeding. Arnold says it makes a man safe and drives away phantasms, resists luxury, prevents conception, and checks the flow of blood or the menstrual discharge. From Pliny we learn that magicians use it in public assemblies. Philosopher affirms that it renders its wearer chaste, safe, and agreeable, if it has been consecrated, and that it dispels noxious phantasms. Thetel is cited concerning the potency of a jasper found inscribed with a man having a shield about his neck or in one hand, a spear in the other, and a snake underfoot. When the image on the gem is that of a man with a bundle of herbs about his neck, the stone should be set in silver and it will possess the virtue of distinguishing between diseases and checking bleeding. Galen is said to have worn this stone on his finger, and Rabanus says that it drives away idle fears. Thus the same properties of the gem are repeated over and over from the mouths of various authorities.

Alchemy.

Before treating of gems in his ninth book Vincent had discussed other minerals and metals in the eighth. There he often alludes to alchemy,[1] which he regards as a practical art related to the science of mineralogy as agriculture is to botany. He also believes that "by the art of alchemy mineral bodies are transmuted from their own species into others, especially metals." [2] It is true that the fourth book of the *Meteorology* of Aristotle contains the statement that artificers cannot alter species but can only make other metals seem like silver or gold. But some say that this passage is not Aristotle's but an addition from some other author. Avicenna in the alchemical treatise *De anima* [3] represents Aristotle and Plato as favorable to alchemy. So Vincent persists in maintaining that, "while the aforesaid words make alchemy seem false in a way, yet it has been proved true both by the ancient philosophers and the artificers of our time," and that "transmutation, or rather disintegration" of metals is truly effected through alchemy. The baser metals may be reduced to their simplest form and then reformed into more precious metals.[4] Vincent also devotes some chapters to "the stone, elixir, by which art imitates nature." [5] Avicenna and an unnamed Alchemist seem to be Vincent's two chief authorities on the subject of alchemy in the *Speculum naturale.* In the *Speculum doctrinale* [6] he again discussed the subject, this time quoting liberally from a treatise *De aluminibus et salibus* attributed to Rasis. A separate treatise seems to have been formed from these chapters of Vincent.[7] Vincent's discussion of alchemy has already been reviewed by Berthelot [8] who noted the theories that everything has an occult quality opposed to its natural one; that four spirits, mercury, sulphur, arsenic, and sal ammoniac, and six metals, gold, silver, copper, tin, lead, and iron, are generated in the bowels of the earth; and that the metals are generated by mercury and sulphur. The last doctrine in its developed form Berthelot regarded as not earlier than the twelfth century. Berthelot was unable to identify the "Alchemist" cited by Vincent. One can hardly accept Berthelot's hypothesis that a work which contains ideas not found in the *Speculum naturale* is later than the thirteenth century. The *Speculum naturale* was written, if not by 1250, at least many years before the close of the century, and, voluminous as are its extracts, it is very far from being all-inclusive of the ideas of the time.

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[1] See caps. 60, 67, 70, 81-84, etc.

[2] This passage has already been quoted in HL XVIII, 488.

[3] Latin text printed Basel, 1572, in *Artis Chemicae principes;* no Arabic original has yet been discovered.

[4] *Spec. nat.,* VIII, 84-85. In our chapter on The Pseudo-Aristotle we have discussed the addition of the passage to the fourth book of the Meteorology.

[5] *Spec. nat.,* VIII, 81-83.

[6] *Spec. doctr.,* XI, 105-107 and 132.

[7] HL XVIII, 459.

[8] Berthelot (1893), I, 280-87.

Virtues of plants.

Like Pliny, Vincent devotes much more space to the vegetable than to the mineral kingdom.[1] But the virtues ascribed to plants are much less marvelous than those credited to stones, and the methods of making use of them are seldom superstitious. In this we have, of course, not merely Vincent's attitude; he reflects his sources and conforms to the usual medieval position. The virtues ascribed to plants are mainly medicinal; many are doubtless false, however, and Vincent, with his voluminous extracts and citations, magnifies the customary ancient and medieval tendency to make each herb a cure for a long list of very miscellaneous and unrelated ailments. Cinnamon and pepper,[2] for example, he appears to regard as panaceas, an interesting side-light on medieval fondness for spices. A fair sample of his ordinary treatment is provided by the chapter on the herb *Cameleon* or *Camelea*. Pliny says that it purges the stomach and removes phlegm and bile. Ulcers are purged by cooking its leaves in two parts of wormwood and drinking them with syrup of honey, at the same time making a poultice of the leaves. They say that if anyone plucks it before sunrise and states that he takes it for white growths of the eyes, the ailment will be removed by its application. Indeed, gathered in any way it is wholesome for the eyes of the young. Dioscorides says that it removes phlegm and makes a healing poultice for foul wounds. Avicenna holds that it should be used only in external applications, where it has cleansing, soothing, and softening properties. It is beneficial for morphea, scab, ringworm, and corrosive ulcers. By this point the citation from Avicenna must have terminated, since we are informed that the roots of the white variety taken in wine as a drink help a patient suffering from dropsy. These roots of the white variety also kill worms, while the black kind kills any venomous creature. Vincent then cites the *Herbarium,* presumably of the pseudo-Apuleius, to the effect that the *Cameleon* has the force of tyriac or theriac, that a decoction of it solves difficulty in urinating and cures intestinal worms and dropsy.[1] Besides the authors cited in the foregoing chapter Vincent makes use on the subject of vegetation of such writers as Solinus, Isidore, the *Hexaemeron* of Ambrose, the work of Isaac on diet, Platearius, and Constantinus Africanus. He apparently does not use Galen's work on medicinal simples directly.

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[1] Books X-XV deal with herbs and trees, while only VIII-IX are devoted to metals, minerals, and gems.

[2] *Spec. nat.*, XIV, 70; XV, 65.

Animals.

Vincent discusses animals at even greater length than vegetation, devoting a book each to birds, fish, and snakes; two to quadrupeds; others to animal life and processes in general; and still others to human physiology and psychology. Again we encounter the marvelous virtues, medicinal and otherwise, inherent in parts of animals, and amusing accounts of their ways and instinctive sagacity. The eagle places certain stones in its nest to counteract its own excessive heat in the hatching process; the bird called "goat-milker" steals milk from goats' udders by night; the cormorant dips its head beneath the wave to collect signs of the weather and flies shoreward clamorously, if it detects a storm approaching; the parrot bites rocks and drinks wine.[2] Pope Alexander had a cloak made of the wool of salamanders which, whenever it became soiled, was cleansed by casting it into the flames instead of washing it in water.[3]

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[1] *Spec. nat.*, X, 50.

[2] *Ibid.*, XVII, 35, 45, 105, 135.

[3] *Ibid.*, XXI, 63

Vincent borrows his statements of the virtues of animals and their parts to a large extent from Pliny, whose contents we have earlier sufficiently presented. The medicinal virtues of the human body and its different parts are also set forth in much the usual fashion. Vincent's considerable number of citations from Physiologus are, like Bartholomew's, difficult to identify with those of any existing Bestiary. Some seem connected with Scriptural Glosses. It is remarkable that while he cites Physiologus a good deal concerning birds and serpents,[1] in the book on quadrupeds he does not cite Physiologus for the lion, *onager,* and other such animals as figure prominently in the so-called Physiologus and Bestiaries.

The tree of life and the bodies of the damned.

In the thirty-first book on paradise and the fall of man Vincent quotes Peter Comestor who, unlike Philo Judaeus, believes in the actual existence of both the tree of life and the tree of the knowledge of good and evil. He states that the tree of life was so called from its natural effect, which was so to strengthen in perpetual solidity the body of him who ate of it that he would suffer no infirmity, anxiety, or old age.[2] Thus Vincent encourages belief not only in transmutation of metals but some natural method of maintaining perpetual youth and health. In the *Mirror of History* he quotes "the sayings of a certain simple and good man," to whom, among other revelations concerning the end of the world, the information had been vouchsafed that the torments of the damned would largely consist in the removal from their bodies of all the good qualities which now temper the contrariety of the bad, which would thus be left to vex them unopposed and unassuaged.[3]

Who sinned the more, Adam or Eve?

Vincent ventures on some amusing theological speculation of his own in discussing the interesting question whether Adam or Eve sinned more in eating the apple.[4] As might be expected of a medieval man and clergyman, he decides against the woman. Eve sinned in four respects and Adam in only two. First she sinned in doubting the divine warning; second, in wishing to steal divinity for herself; third, in eating contrary to the prohibition; fourth, in tempting man to eat. Adam was not seduced into thinking that he could become divine by this method, but was led astray by a certain amiable good-will, fearing to offend his wife if he did not eat the apple which she offered him. Thus Eve's intention in sinning was the worse and woman has been punished for it the more severely. Yet Adam sinned in two respects, namely, in secret pride and in eating what had been forbidden. Another reason why Eve was the greater sinner was that she sinned against more persons; against God, against herself, and against her neighbor. But in one respect Adam's sin was the graver; he knew better, while Eve sinned in a certain measure from ignorance and feminine incapacity.

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[1] *Spec. nat.,* XVII, 22, 28, 29, 32, 36, 41, 42, 50, 148; XXI, 13, 20, 21, 39, 44, 47, 48, 54, 172.

[2] *Ibid.,* XXXI, 5.

[3] *Spec. hist.,* XXXII, 119.

[4] *Spec. nat.,* XXXI, 73.

Classification of the sciences.

We may also note Vincent's classification of the sciences. As he adopted the common Christian division of the world's history into six ages, as in the *Speculum naturale* he followed the order of the six days of creation, so in the third *Mirror of Doctrine* he made six fields of knowledge; literary, moral, mechanical, physical, mathematical, and theological.[1] This suggests Roger Bacon's selection of the five most essential subjects leading up to the study of theology, namely, the languages, mathematics, perspective or optics, experimental or applied science, and moral philosophy.

Concluding estimate of the *Speculum naturale*.

Such is the *Speculum maius* or more particularly the *Speculum naturale,* a work impressive by its very voluminousness and multitude of citations of authorities, valuable as a work of reference, a great storehouse of medieval lore, providing somewhat the same retrospect upon previous medieval and Latin science as Pliny's *Natural History* afforded for Hellenistic science. We can, however, recover more of its sources than in the case of Pliny; and when we have read them, Vincent's excerpts from them drop to a secondary place in our esteem. We see how much of his work had been done for him by previous compilers like Bartholomew of England and Thomas of Cantimpré, and how large a portion of his work is a repetition of Pliny himself. Vincent's volumes suggest the use of scissors and paste a little too manifestly. On the other hand, his work does not include everything that is in previous medieval writers on nature, to say nothing of others that were to come after him, and the assumption made even by specialists in the study of medieval culture, like Rose, Berthelot, and Mâle, that the *Speculum naturale* alone is an adequate reflection of medieval natural science and that Vincent is sure to mention any previous writer or treatise,—this assumption is far from true. His *Mirror* is a glass through which we see darkly and not face to face.

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[1] HL XVIII, 517.

CHAPTER LVII

EARLY THIRTEENTH CENTURY MEDICINE: GILBERT OF ENGLAND AND WILLIAM OF ENGLAND

Representatives of thirteenth century medicine—Question of Gilbert's date—Works ascribed to Gilbert—The *Compendium medicinae*—General character of his medicine—An estimate of it by a modern physician—Picturesque compounds—*Empirica* and an old wife's remedy—Use of red for smallpox; occult virtue—Magical treatment of epilepsy—Poisons and snake-oil—Eye cures—Influence of the stars—The soul, number, and geometry; physiognomy—Astrological medicine in William of England's *De urina non visa*—Other works by William of England or by other Williams.

Representatives of thirteenth century medicine.

MEDICAL writers of the thirteenth and early fourteenth century are so numerous and their writings so similar, that it will be advisable to treat of only two or three of them as examples of the rest. At the close of the thirteenth century Peter of Abano and Arnald of Villanova were such important personalities and so addicted, the one to astrology, and the other to occult science, that we must devote an entire chapter to each. Of the writers before them it will perhaps be sufficient if we consider in some detail, first Gilbert of England, who seems to have flourished in the first half of the thirteenth century and who was much cited by the later medical writers; next, a brief but significant work in astrological medicine composed in 1219 by a William of England (or of Aragon?); and finally in a second chapter Petrus Hispanus, who terminated his brilliant career in 1277 as Pope John XXI, and to whose account of "the way of experience" we shall add briefly something concerning the similar discussion of medical experiment in John of St. Amand who seems to have written between 1262 and 1280.[1]

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[1] HL, XXI, 541.

Question of Gilbert's date.

It seems certain from the citation of Gilbert by Petrus Hispanus and other writers—possibly by Bartholomew of England—that he must have written rather early in the thirteenth century.[1] Haeser,[2] who dated him about 1290, and Freind, who dated him about 1270, are both certainly wrong. But his date has not yet been fixed with exactness, and it is doubted whether he was physician to Hubert Walter who died in 1205, as Bale, Pits, and Leland tell us. It is also disputed whether a Master Richard whom he cites was Richard of Salerno, who flourished at the close of the twelfth century, or Richard of Wendover and Paris, who was physician to Pope Gregory IX (1227-1241) and died himself in 1252 or 1256. Because our Gilbert cites Averroes it has been argued [3] that he did not flourish until the middle of the thirteenth century but Michael Scot had translated Averroes' commentary on the metaphysics of Aristotle early in the century.

Works ascribed to Gilbert.

A manuscript in the Bibliothèque Nationale at Paris contains *Experiments of Master Gilbert, Chancellor of Montpellier*,[4] and there was a chancellor of that university named *Gillibertus* in 1250. It remains uncertain, however, whether he was the same as Gilbert of England, and whether the *Experiments* are by Gilbert of England or perhaps a later compilation made partly from his *Compendium* and partly from other sources. The *Dictionary of National Biography* describes the *Experiments* as "a collection of receipts, many of which bear Gilbert's name and are certainly his, for they agree closely with passages in his *Compendium* without being identical." If "Experiments of a Chancellor and

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[1] On the life of Gilbert, besides the articles in DNB and HL 21 (1847), 393-403, see J. F. Payne, *British Medical Journal* (Nov. 12, 1904), 1282, and H. E. Handerson, *Gilbertus Anglicus*, 1918 (published posthumously for private distribution by the Cleveland Medical Library Association, Cleveland, Ohio), 18-24.

[2] Haeser, *Lehrbuch d. Gesch. d. Medicin*, I, 711.

[3] DNB, article on Gilbert.

[4] BN 7056, fols. 93r-95r, "Experimenta magistri Gilberti Cancellarii Montepessulani"; many of them open, "Gilbert said"; they have been published with a discussion of their authorship by P. Pansier, in *Janus*, (1903).

Cardinal" in a manuscript at Madrid [1] were the same work, there would be reason for thinking that Gilbert of England became a cardinal. "A secret of Gilbert the cardinal" is contained in an alchemistic manuscript of the fifteenth century at Cambridge.[2] We also hear of a Gilbertus Anglicus who was a great theologian and wrote a commentary upon the oracle of Cyril the Carmelite.[3] It would not be strange to have in the course of a century or two more than one writer from England named Gilbert. But it also at that time would not be strange to have the same man write on medicine and theology, and such a man is just the one who might be expected to fill both the posts of chancellor at Montpellier and cardinal at the papal court. We shall see that Peter of Spain wrote on logic as well as medicine and became pope. But to note one or two other treatises that have been ascribed to Gilbert of England. An *Antidotarium* which is ascribed to him in a thirteenth century manuscript [4] is perhaps a portion of the *Compendium,* but the commentary of Gilbert on the *Verses of Giles concerning Urines* was an independent and well-known work.[5]

The *Compendium medicinae.*

Gilbert's chief work, and the one which we shall discuss, is the *Compendium medicinae,*[6] a medical compilation in seven books. Its quotations from the *Surgery* (*Chirurgia*) of Roger of Parma inclined Dr. Handerson to date it about 1240 and not before 1230.[7] It seems to have set the style for such works as the *Lilium medicinae* of Bernard Gordon and the *Rosa medicinae* of John of Gaddesden.[8] The first book deals with fevers, the second begins with the hair, the third treats of diseases of the eyes, the fourth of ills of the neck and throat, the fifth discusses the appetite, the sixth the liver, and the seventh the private parts. The seven books of Gordon's *Lilium* cover the same ground respectively, except that Gordon omits the surgical passages which Gilbert incorporated in his work.[1] E. Littré in the *Histoire Littéraire* has described Gilbert's work as "abounding in superstitious or ridiculous or childish formulas." To these Gilbert often adds such expressions as "This has been proved," or copies the accounts in his authorities even to such phrases as "in our presence." But we have already seen this to be the practice in the far-off days of Aëtius of Amida. Gilbert also often calls this or that assertion false, but here again the scepticism probably does not always originate with him. His work is of course professedly a compilation. Gilbert nevertheless seems at times to speak from his own experience and medical practice.

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[1] Escorial P-II-5, 14th century, fols. 69v-74, Incipiunt experimenta Cancellarii et Cardinalis.

[2] Trinity 1120 III, 15th century, fols. 19-21.

[3] Gonville and Caius 388, 14-15th century, fol. 103, "Gilbertus Anglicus super oraculum Cyrilli Carmelitae. Frater Gilbertus anglicus, magnus ille theologus. . . ."

[4] Gonville and Caius 379, 13th century, fols. 134-41r, headed in an old hand, "Inc. Antitodus Gileberti . . . / . . . Expl. Antidotarium Guilberti."

[5] Many copies of it are listed in the 15th century catalogue of MSS of St. Augustine's Abbey at Canterbury. An extant 13th century MS at Cambridge is St. John's 99, fols. 11-22v, "Versus Egidi de urinis cum commento gilberti."

[6] The following citations will be to the edition of Lyons, 1510.

[7] Handerson (1918), pp. 22-24.

[8] For a treatment of him in English see H. P. Cholmeley, *John of Gaddesden and the Rosa Medicinae,* Oxford, 1912. The

General character of his medicine.

If one were to attempt a brief general characterization of Gilbert's medicine, it would be that he combines Aristotelian principles and reasoning, and the hypothesis of four elements and four qualities, with a practical regimen of bathing, diet, bleeding, plasters, rubbing with ointments, and the like—which is perhaps largely Salernitan. His procedure is vitiated by a large residuum from early magic as well as by incorrect scientific hypotheses handed down from the Greek philosophers. His pharmacy, however, makes more use of herbs than of gems or of parts of animals. But his recipes are legion and many of them include an absurdly large number of ingredients. He also discusses the signs of diseases, their course and character, and the processes of the human body.

Rosa was printed at Pavia, 1492 (the John Crerar Library, Chicago, has a copy of this edition), and again in 1516 and 1595. Gordon's *Lilium* was printed at Venice in 1496 (also in the John Crerar Library); it had previously been translated into French and Spanish. See HL. 25, 329ff. for Gordon's life and other writings.

[1] "Gordon's work does not contain a single chapter on surgery proper," Handerson (1918), 77.

An estimate of it by a modern physician.

Since I wrote the preceding paragraph, a rather detailed presentation of the contents of Gilbert's *Compendium* has fortunately been published in English from the pen of one better fitted than I to judge its medical defects and merits. Dr. Handerson's eminently sane conclusions may be briefly indicated by two quotations. "It is not difficult, of course, to select from the Compendium a charm or two, a few impossible etymologies and a few silly statements, to display these with a witty emphasis and to draw therefrom the easy conclusion that the book is a mass of crass superstition and absurd nonsense. This, however, is not criticism. It is mere caricature." [1] "The book is, undoubtedly, the work of a famous and strictly orthodox physician, possessed of exceptional education in the science of his day, a man of wide reading, broadened by extensive travel and endowed by the knowledge acquired by a long experience, honest, truthful, and simple minded, yet not uncritical in regard to novelties, firm in his own opinions but not arrogant, sympathetic, possessed of a high sense of professional honor, a firm believer in authority and therefore credulous, superstitious after the manner of his age, yet harboring, too, a germ of . . . healthy scepticism." [2]

Picturesque compounds.

Some of Gilbert's over-elaborate compounds possess picturesque names as well, for instance, the potion of St. Paul and the ladder of Hermes.[3] The latter was composed at Heliopolis on the altar of the sun and written not in letters but figures. It consists of sixty different simples and is called a ladder because the amount of these simples used in the compound is increased step by step. First one takes one ounce each of four simples, then two ounces each of four more, and so on for four species at a time, until the quantity of fifteen ounces is reached and the list of sixty simples is exhausted. This compound is asserted to be beneficial for rather more than fifteen ailments.[4] Gilbert employs various Salernitan pills and they usually contain from ten to twenty ingredients each.

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[1] Handerson (1918), p. 75.

[2] *Ibid.*, 76.

[3] *Compendium medicinae*, fols. 119v. and 357r.

[4] Possibly there is some connection between the 15 steps of this ladder of Hermes and the 15 fixed stars of first magnitude

Empirica and an old-wife's remedy.

When other remedies fail Gilbert has recourse, like Marcellus, to *empirica.* One by which many "under our charge" (*in manu nostra*) who were thought sterile have borne children is as follows.[1] In the vigil of St. John the Baptist [2] dig certain herbs by the roots from the earth before the third hour, repeating the Lord's Prayer thrice and not speaking to anyone going or returning. In silence, too, extract the juice from the herbs and write on a piece of parchment these words, "The Lord said, 'Increase' x Uthiboth x 'and multiply' x thabechay x 'and fill the earth' x amath x." If the man wears this writing about his neck, a boy will be born; if the woman wears it, a girl. Other *empirica* employ suffumigations with a tooth of a dead man and an herb that has grown through a hole in a stone. In another passage to aid child-bearing Gilbert recommends the water in which a murderer has washed his hands.[3] He repeats the good old remedies for gout of binding frogs' legs or asses' hoofs or tortoises' feet upon the patient's extremities, right on right and left on left, but cites therefor the mysterious authority "Torror," while "Funeius" is his source for the use of the magnet in the same way. Gilbert states, however, that he has little inclination towards these things, but that it is just as well not to omit what the ancients have said.[4] In another passage he tells that a certain old woman has freed many persons from jaundice with the cooked juice of the plantagenet.[5]

Use of red for small-pox: occult virtue.

Gilbert is credited with being the first to mention the employment of red colors in the treatment of small-pox.[6] It is interesting to note that the passage in which he does this has to do also with the practices of old-wives and with

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and the treatise ascribed to Enoch or Hermes on 15 stars, 15 herbs, and 15 stones.

[1] fol. 287r.

[2] Or Midsummer eve.

[3] fol. 307r. "Lotio manuum alicuius interfectoris detur."

[4] fol. 327r. "Quamvis ego declino ad has res parum, tamen est bonum scribere in libro nostro ut non remaneat tractatus sine eis qui (?) dixerunt antiqui."

[5] fol. 260v.

[6] Handerson (1918), 52.

the conception of occult virtue. He writes, "Old women of the countryside give burnt purple in drink, for it has the occult nature of curing *variolae*. The same is true of dyed cloths." [1] Here again therefore we seem to have a real discovery developed from or concealed beneath a bit of experimental magic. John of Gaddesden is said to have used scarlet cloths to cure a son of Edward I of small-pox.

Magical treatment of epilepsy.

The following very magical procedure is used for epilepsy and is called *expertissimum*.[2] At the first access of the disease, when the patient falls to the ground, all his clothes except his shirt should be removed and placed at his feet. The nails of all his fingers and toes should next be clipped and wrapped in a cloth. A long white thorn is then to be split and the patient dragged feet first through the cleft as far as his middle. The thorn should then be cut into small bits and placed with the nail parings. Next the patient's hair should be cut in three places. These clippings of hair and the knife used in the operation are then to be added to the other paraphernalia wrapped in the cloth, and the whole is to be buried underground, and the following words uttered. In the patient's right ear, "Christ conquers"; in his left ear, "Christ reigns"; and to his face, "Christ commands." Others perform the ceremony differently, cutting the patient's shoe latchet into four pieces and burying them in the form of a cross at his head, feet, and either hand with some of his nails and hair. And the names of the three kings—that is, the Magi who came to adore Christ—should be worn about his neck.

Poisons and snake oil.

Gilbert's account of poisons repeats such usual statements as that the saliva of a fasting man is poison for snakes,[3] that the viper deposits its venom on a stone by the shore when entering the water to have commerce with the fish, and that there was a girl fed on poison who caused the deaths of kings who loved her and whose saliva killed animals who approached her.[1] Gilbert cites for the last "Ruffus," however, and not the *Secret of Secrets*. A medicinal unguent is made by cutting off the heads and tails of snakes, as in Galen's directions for preparing theriac, and distilling an oil from them.[2]

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[1] fol. 348. "Vetule provinciales dant purpuram combustam in potu, habet enim occultam naturam curandi variolas. Similiter pannus tinctus de grano."

[2] fol. 111v.

[3] fol. 349r.

Eye cures.

Parts of animals are much employed in corrosives for eye complaints. Green lizards, all gall, but especially that of birds of prey, *omne stercus* but human especially, all salts but especially nitrates, the inner skin of a hen's liver, the blood of a black fly, and many other similar substances are recommended.[3] For spots in the eyes Gilbert suggests administering whole in drink the little worms with many feet which are found between the bark and trunk of trees. "But they should be taken with the Lord's Prayer." [4]

Influence of the stars.

Occasionally a passage evinces Gilbert's belief in the influence of the stars. He speaks of the participation of the heavens in the process of human generation [5] and of the influence of the various planets on the formation of the embryo in the womb.[6] In arguing that a poisonous compound multiplies its potency through the union of the species composing it, and that it "has a stronger action than if it were simple" [7]—a passage in which there is a close approach to our conception of chemical change—Gilbert adduces the influence of the heavens as a factor in increasing the strength of the compound. He holds that the celestial bodies resemble terrestrial mineral substances in not feeling pain, but that unlike them they are sentient, sensible, and unchangeable. They are bodies, but uncorruptible.[8] Arnald of Villanova [9] at the end of the century cites Gilbert's warning in his first book on fevers against bleeding the patient during dog days or the Egyptian days or when the moon is in conjunction with a malevolent planet. Gilbert adds that the wise doctor will always observe the moon.

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[1] fol. 348v.

[2] fol. 120v.

[3] fol. 134.

[4] fol. 136r.

[5] fol. 284v.

[6] fol. 305v.

[7] fol. 350v.

[8] fol. 304r.

[9] *Regule Generales Curationis Morborum*, Doctrina IV. "Item ille Gilbertus anglicus in prima parte sui libri in cura ethice." That is, in that portion of the first book of the *Compendium* devoted to the fever called "ethica." This passage in Gilbert is also referred to by Handerson (1918), 29.

The soul, number, and geometry; physiognomy.

In the midst of his discussion of dropsy Gilbert digresses to treat of the soul, "because ignorance gives birth to shame and stupidity to poverty." Some traces of numerical and geometrical mysticism are seen in his discussion.[1] He represents Pythagoras as saying that the soul is number moving itself, and that of its four properties or functions intellect is like the number one because it comprehends simple matters and so is compared to a point. Reason is like two or a line since it comprehends form as it exists in bodies. Opinion is like four or a surface because it comprehends form as form. Science is like eight or a cube because it comprehends form *ut est in subiecto.* Gilbert further explains that the three souls assigned to man by Aristotle are really the triple power of one soul.[2] He compares the vegetative soul to a triangle, the sensible soul to a square, and the rational soul to a circle. Gilbert regards the disagreement between Aristotle and Plato concerning the movement of the soul as verbal rather than real. "Aristotle discusses matters truly, essentially, and philosophically; Plato, figuratively, casually, and mathematically." Gilbert occasionally embodies the dicta of the physiognomists in his *Compendium,* for instance: "He whose eyes are large and tremulous is lazy and a braggart and fond of women"; and "He who has large ears is stolid and long lived." [3]

Astrological medicine in William of England's *De urina non visa.*

Because perhaps of Gilbert's commentary upon the verses of Giles concerning urines, a Master G. of England who is the author of "a book in which he tells how to know the character of the urine without inspecting it and many other things by means of astrology," in a Vienna manuscript is called in the catalogue Gilbertus instead of Guilelmus Anglicus.[4] As many other manuscripts [5] of the treatise show, the work is really the *Of Urine Unseen* written in 1219 by William of England, a citizen of Marseilles, by profession a medical man, by merit of science an astronomer, as he himself states. Indeed, there are extant other astronomical works by him, one of which is dated 1231.[1] The object of the brief treatise is how to tell the nature of the patient's disease and the outcome of it from the stars and signs of the zodiac without inspection of the patient's urine. The nine chapters deal with (1) "the quadruple way of astrological speculation," that is, nativities, revolutions, interrogations, and elections; (2) "the comprehension of the effects of superior bodies" on the human body for each sign of the zodiac and the use of astrology in medicine; (3) the division of the human body among the planets and their natures and properties with the diseases appropriate to them; (4) the houses of the planets; (5) the distribution of the parts of the body among the planets and signs with an accompanying chart of eighty-four squares arranged in seven columns and twelve rows; (6) how to arrive at a judgment in any particular case by finding the ruling planet;[2] (7) "of the place of the liver and its significator and the virtues of

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[1] fol. 243r.

[2] fol. 244r.

[3] From Handerson (1918), 34-36 where further illustrations are given.

[4] Vienna 5207, 1342 A. D., fols. 208-10, "Incipit liber magistri G(ilberti) Anglici in quo docet cognoscere disposicionem urine non vise et multa alia secundum astrologiam."

[5] Some MSS are: Cotton Ap-

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pendix VI, fols. 2-5; Sloane 3281, 13th-14th century, fols. 76v-79; Harleian 2269, a paper folio, fol. 88; Ashmole, 345, 14th century, fols. 70-74; Ashmole 393, 15th century (?), fols. 56-57v, "Explicit liber Anglici nationis quondam civis Marsiliensis de urina non visa editus 1219"; Canon. Misc. 46, 15th century, fols. 61-67; CU Trinity 1406, 15th century, fols. 173-6; BN 7298, 14th century # 17; BN 7328, 7413, 7416, 7440; CLM 267, 14th century, fols. 46-8; CLM 588, 14th century, fols. 93-6; Berlin 963, 14-15th century, fols. 74-6; Vienna 5311, 14-15th century, fols. 42-52; Amplon. Folio 37, fols. 49-51, de urina non visa, followed at fol. 52 by "de pactis secundum astrologiam," which would seem to be another treatise; Amplon. Quarto 196, 361, and 391; Amplon. Quarto 345, 14th century, fols. 53-4 astrologia de iudiciis medicine, is probably the *De urina non visa;* but Amplon. Quarto 357, 13-14th century, fols. 1-21, astrologia, seems rather long for it.

I have read the treatise in Cotton Appendix VI, Canon. Misc. 46, and Ashmole 345. It opens, "Ne ignorancie vel pocius invidie redarguar, mi Germane, qui quandoque apud Masciliam aliquando mecum studuisti . . ." but the wording of this opening sentence varies a little in different MSS.

Duhem, III (1915), 287-91, suggests that "mi Germane" may refer to Gilbert of England who would thus be William's brother or cousin.

[1] They will be found listed with references to MSS and such portions as have been printed in Duhem, III (1915), pp. 287-91.

[2] "de inventione iudicis cui nomen almutaz."

the same"; (8) of the color and substance of the urine; (9) of the outcome of the sickness and its end. William mentions in closing a case where he correctly predicted that the patient would die in exactly two months and eight days.

Other works by William of England or by other Williams.

We have already alluded elsewhere [1] to "the very great secret of Catenus, king of the Persians, concerning the virtue of the eagle" which William of England is credited with having translated from the Arabic. And we have suggested that a William of Aragon who commented upon the *Centiloquium* ascribed to Ptolemy and wrote a treatise on the interpretation of dreams might possibly have been the same man.[2] We also hear of a "William, master of medicine, of Provençal nationality," who translated from Greek into Latin the life of the philosopher Secundus, which work he brought with him from Constantinople. Afterwards, we are told, this William became a monk of St. Denis and finally the abbot of that monastery. Secundus is described as a philosopher who observed the rule of silence and led the life of a Pythagorean, and who was associated with the emperor Hadrian.[3] He appears to have broken his silence enough to give forth *Sententiae* which were treasured up by that emperor.[4]

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[1] See above, p. 93.

[2] See above, p. 301. I realize that William would have to be indeed a cosmopolitan to come from both England and Aragon as well as being a citizen of Marseilles; but copyists may have confused Aragon and Anglicus, although it does not seem very likely.

[3] CUL 186, 13-14th century, fols. 66-67, "Incipit vita Secundi philosophi de Greco in Latinum translata a Magistro Willelmo medico natione Provinciali. Hanc secum de Constantinopoli detulit; post factus monachus in cenobio Sancti Dionisii; ac postremo perficitur Abbas eiusdem loci." Opens, "(S)ecundus fuit philosophus: hic philosophatus est omni tempore silentium conservans, et Pitagoricam ducens vitam." Ends, "precepit eius libro sacre bibliothece inseri et intitulari."

CUL 1391, 14th century, fol. 214v, "De Secundo philosofo," has the same Incipit.

Other MSS are CLM 9528, 13th century, fol. 33-, "Erat quidam philosophus Secundus dictus; and CLM 18757, 15th century, fol. 22-25.

There are doubtless many more MSS. Manitius (1911), p. 285, states that "Der lateinische Secundus findet sich übrigens in alten Katalogen von s. XIII an nicht selten, . . . nämlich in Canterbury (Christ-Church und St. Augustin), Dover, Peterborough, Prüfening, Durham, bei Benedikt XIII, Amplonius von Ratinck, Borso d'Este und in Leicester."

[4] The *Dicta* or *Sententiae* of Secundus were printed with the *Altercatio Hadriani Aug. et Epicteti philosophi,* in 1628; see Manitius (1911), pp. 268 and 284.

CHAPTER LVIII

PETRUS HISPANUS

Nationality: at Paris—Medical works and later life—Death and character—The *Thesaurus pauperum*—Is it interpolated?—Its essential character is fairly represented even by the printed version—Devout tone of its preface—Arrangement of the text—Emphasis on occult virtue—Authority and experiment—Some of Peter's authorities—Parts of animals; suspensions—Remedies for toothache—Prescriptions for epilepsy—Against sorcerers and demons—*De morbis oculorum*—*Summa de conservanda sanitate*—A marvelous treatise on waters—Other works ascribed to him—*Commentaries on Isaac's Diets;* their scholastic method—Their questions concerning nature—Absence of astrology and occult virtue—Incorrect ideas about nature—Reason and experience—*Via experimenti*—Question of Peter's relation to Roger Bacon and Galen—John of St. Amand on medical experimentation—Natural and occult science in John of St. Amand—Appendix I. Some Manuscripts of the *Thesaurus pauperum.*

Nationality: at Paris.

PETRUS HISPANUS, or Peter of Spain, who finally became Pope John XXI, is said by Ptolemy of Lucca, who died fifty years after him in 1327, to have been of Portuguese nationality.[1] His birth is placed at Lisbon between 1210 and 1220, and he is said to have been the son of a physician named Julian.[2] However, in the preface to his *De conservanda sanitate,* as preserved in a fifteenth century manuscript, Peter speaks of himself as from Compostella and as familiar with all Italy, Burgundy, Gascony, and parts of

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[1] *Ptolemaei Lucensis Historia Ecclesiastica, Liber XXIII, cap. xxi,* in Muratori, XI, 1176. For the life of John XXI see also HL XIX (1838) 322-34; J. T. Koehler, *Vollständige Nachricht von Pabst Johann XXI,* Göttingen, 1760; L. Zdekauer, in *Bullettino Senese di Storia Patria,* VI (1898-1899); Richard Stapper, *Papst Johannes XXI,* Münster, 1898, in *Kirchengesch. Studien herausg. v. Dr. Knöpfler, Band IV, Heft iv.*

[2] Millot-Carpentier (1901). G. Porro, in his catalogue of Trivulzian MSS at Milan, Turin, 1884, calls Peter "Petrus Julianus Ulissiponensis."

Spain.[1] In other manuscripts he calls himself Petrus Hispanus. He came to the University of Paris at an early age, as he himself testified when pope in a letter to the bishop of Paris.[2] In the same epistle he refers to the many years he spent at Paris occupied with varied studies. His text-book in logic was universally adopted and often commented upon, and has now been shown to be, not, as Prantl held in his *History of Logic*,[3] a copy of the work of Psellus, but an independent product of the Parisian school. It was printed from forty to fifty times between 1477 and 1519.[4]

Medical works and later life.

From 1246 to 1250 Peter was at Siena in the faculty of arts. Perhaps he then wrote the letter to the emperor, Frederick II, *On the Rule of Health,* if it be a genuine work, which precedes his *Thesaurus pauperum* in at least one manuscript.[5] Ptolemy of Lucca calls Peter "an all-round scholar and specialist in medicine," [6] and mentions particularly among his medical works the famous *Thesaurus pauperum,* which we shall presently consider as a very influential and representative handbook of medieval medicine. In all seventeen medical works are attributed to Peter, of which only three have been printed.[7] At the beginning of his treatise on eye diseases Peter speaks of himself as a professor of the art of medicine and an investigator of the truth.[8] In the *Thesaurus pauperum* he cites Albertus

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[1] Royal 13-A-VII, 15th century, fol. 149r.

[2] Stapper (1898), p. 4, "In illis namque laribus ab annis teneris diutius observati variis scientiis inibi studiose vacavimus et per annos plurimos. . . ."

[3] See too, C. von Prantl, *Michael Psellus und Petrus Hispanus,* 1867.

[4] HL XIX, 330.

[5] Harleian 5218, fols. 1r-3r, *Epistola Magistri Petri Hyspani missa ad Imperatorem Fridericum super regimen sanitatis.* It seems strange, however, that Peter should call himself, as he does in this work, "senex artis medicinae professor," before 1250, when he would have been rather less than forty years of age. Other MSS. are: CLM 615, 13-14th century, fols. 41-68; BN 7446, 15th century.

[6] "Hic generalis clericus fuit et praecipue in medicinis."

[7] HL XIX, 327-8; namely, the *Thesaurus pauperum,* and the commentaries on Isaac on *Diets* and *Urines.*

[8] Sloane 1214, 15th century, fols. 38r-46, *De morbis oculorum.* Other MSS of his work or works on eye diseases are: Sloane 2268, 14th century, fols. 52-59; CLM 161, 13th century, fols. 55v-57, *de aegritudinibus oculorum;* CLM 40, 14th century, fols. 112-15, *Breviarium de aegritudinibus oculorum;* CLM 381, 14th century,

Magnus as well as Gilbertus Anglicus, but he probably did not write it very late in life. Pope Gregory X made Peter a cardinal in 1273,[1] he was also an archbishop, and in 1276 the career of the celebrated scholar culminated in his election to the papal see following Gregory's death.

Death and character.

The next year Peter met an untimely death from the fall of a ceiling, a catastrophe which according to the gossip of Ptolemy of Lucca occurred while he was engaged in a fit of complacent and self-admiring laughter and shortly after he had issued some fulminations against the monks, for whom he had little love. Ptolemy criticizes the pope as not dignified enough in speech and manner for his office, but concedes that he was easily approached and very kindly to all scholars and men of letters. Millot-Carpentier regarded him as "assuredly one of the most illustrious personages of the thirteenth century both as a philosopher and as a dialectician," and as "a true scholar and worthy representative of the University of Paris, . . . having all the faults of his time but endowed with a liberal spirit."-[2] Millot-Carpentier also gives a list of ecclesiastical offices, honors, and dignities held by other physicians of the period in addition to the supreme honor of a papal election which Peter attained.

The *Thesaurus pauperum.*

Peter's book, the *Thesaurus pauperum,* became perhaps the leading brief medical manual during the remainder of the middle ages, as the numerous extant manuscripts and many printed editions bear witness.[3] It was translated into

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fol. 78-, *Curae . . . de passionibus oculorum, vel Secretum pro amico ad oculos;* CLM 438, 14th century, fol. 108, *de passionibus oculorum;* Wolfenbüttel, 2794, 15th century, fols. 183-8, *Petri Hispani liber oculorum,* fol. 188v, *Secretum magistri Petri Hispani;* BN 6957, 15th century, # 1, *Secretum de oculis.*

[1] Cholmeley, *John of Gaddesden,* 1912, p. 183, says that Peter had been Gregory's physician.

[2] Millot-Carpentier (1900), p. 180.

[3] Printed at Antwerp in 1476 and 1497, at Lyons in 1525, at Frankfurt perhaps in 1567, 1575, 1576, and certainly in 1578, at Paris in 1577. I have used the 1497 edition, — *Summa Experimentorum sive thesaurus pauperum magistri Petri yspani, Antwerpiae, Theodoricus Martini, 1497* (*die 22 Mai*). A letter lying loose in the copy (numbered IB. 50018) which I read at the British Museum, stated that the copy at Liège is (was) the same. I also consulted the edition printed at

Spanish, Portuguese, Italian, and English. The work was intended to be a condensed compilation and its title, "The Treasure of the Poor," indicates that it was written especially for the benefit of poor students and medical practitioners, who could not afford many books. It thus continues the type of book represented by Galen's *Euporista* and by the compendiums of post-classical medicine, and is to be regarded, like Bartholomew of England's "On the Properties of Things," as an example of a medieval text-book and not as a specialized work.

Is it interpolated?

Stapper states in his Life of Pope John XXI[1] that the text of the *Thesaurus pauperum* has suffered greatly from later interpolations, that every successive transcriber of the manuscript felt at liberty to add any further recipes of past authors that hit his fancy, and that thereby a great deal of superstitious nonsense for which the pope should not be held accountable was added to the original work. But on what authority or from what personal inspection of manuscripts Stapper makes this assertion is not clear. He lists, it is true, a number of manuscripts in continental libraries and a few at Oxford, but his citations of the *Thesaurus pauperum* are all from the Lyons edition of 1525. It is also true that he affirms that he has searched the manuscripts in vain for the sentence in the preface of the printed text in which it is stated that ligatures are not superstitious. But I have found the passage without much search in three manuscripts of one library.[2] Possibly one reason why Stapper failed to find it is that the opening word of the sentence is not *Litteras,* which he gives presumably from the 1525 edition, and which would mean "characters" if it could

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Frankfurt in 1578 but it seemed faulty compared with the 1497 edition. For a list of MSS see Appendix I at the close of this chapter.

[1] Stapper (1898), p. 23.

[2] Sloane 284, Harleian 5218, Additional 25,000 contain the sentence; Sloane 521 and 2479, and Royal 12 B III do not have it. The entire preface is missing in Addit. 22,636 and in the early MS, Sloane 477, but it also has no *Incipit* and a first sheet may well be missing which contained the preface.

mean anything in the context in question, but *Ligaturas,* as the 1497 edition correctly has it.[1]

Essential character of the work fairly represented even by the printed version.

My own feeling is rather that the book, even in the printed editions of 1497 and 1578 which I had access to, is not more superstitious than one would expect a compilation of ancient, Arabic, and medieval medicine to be. The 1497 edition, it is true, confesses to a number of additions from a Peter of Tuscany (? *de tusciano*) and from Bernard Gordon; but it gives these additions separately at the close of various chapters. I have also inspected a number of manuscripts of the work at the British Museum, none of which Stapper mentions in his list, and which date from the fourteenth and fifteenth centuries. It is not easy to compare these different copies or versions, since they vary greatly in headings and arrangement, so that the same statement may be found in different places in them. But there seem to be passages in the 1497 edition which are not in the manuscripts, and these in turn, as is usually the case, are not all alike in contents.[2] But while there may be considerable interpolation, it does not seem to have essentially altered the original character of the book. The superstitious nonsense may have increased in amount but scarcely in degree. Much the same sort of remedies may be found in the earliest manuscript and latest printed text. To be on the safe side, however, in the ensuing account of the *Thesaurus pauperum* I shall follow the manuscripts rather than the printed text. I shall then add some account of other treatises which I have found ascribed to Peter in the manuscripts and of his printed Commentaries on Isaac's *Diets*.

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[1] The sentence as Stapper gives it (p. 24), reads: *"Litteras autem quas aliquando ponunt physici superstitiose positas nemo credat, sed quia immediatius operantur vel magis assidue, sicut dextrum dextro vel sinistrum sinistro membro et masculo apponitur."* In the 1497 edition and Sloane 284 the sentence reads more correctly: *"Ligaturas autem quas aliquando posuerunt philosophi nemo credat superstitiose positas, sed immo quod (ideo quia) immediatius operantur vel magis assidue si (vel aliter) numquam deponuntur vel a simili sicut si ad (aliud) dextrum dextro membro vel sinistrum sinistro vel masculinum masculino apponatur."* In the 1578 edition the sentence has been completely changed and begins: *"Characteres vero et de collo suspendenda quorum interdum a Philosophis sit mentio nemo arbitretur superstitiose tradita esse sed ideo quia immediate operantur vel magis per ἀντιπάθειαν. . ."* etc.

[2] For instance, among remedies for sore throat an herb "divinely revealed to good bishop Boniface" and "a good prayer" were detailed in the 1497 edition, but I failed to find them in Sloane 477, Sloane 2479, Additional 32,622, or Royal 12-B-III. The next remedy after the good prayer was given in Sloane 477 only in the margin, but in Additional 32,622 appeared in the body of the text. In the chapter on toothache, too, a remedy written in the margin in a different ink from the text of Sloane 477 is embodied in the text of Sloane 521 and 2479 as well as in the 1497 edition.

Devout tone of its preface.

The brief preface, which appears in most of the manuscripts that I have seen as well as in the printed editions, gives a good idea of the nature of the work. Its opening sentence reflects the religious spirit of the age and status of the author. "In the name of the holy and indissoluble Trinity, who created all things which are not God and who endowed individual objects with their particular virtues, from whom all wisdom is given to the wise and science to scientists, I approach a task beyond my powers trusting in the aid of the same, who works through us as instruments all good works." In a second sentence, given differently in the manuscripts and printed texts, the author states the title of his work, *Thesaurus pauperum*. Later he adds that the attentive reader will find here easy and efficacious medicines for almost all infirmities, provided he has Him as helper who created medicine from earth. He also warns the physician, lest by his science he impugn God the giver of science, to take the utmost care not to reveal to anyone any medicines by which pregnancy may be prevented or abortions provoked. In most manuscripts that I have examined the preface presently concludes with the sentence, "Therefore in the name of Jesus Christ, the supreme physician, who heals at His will all our infirmities, since He is the head of the faithful, let us begin with diseases of the head and descend to the feet."

Arrangement of the text.

This top to toe order, taking up one ailment after another and listing remedies in connection with each, was already common [1] and is generally followed with some variations in the manuscripts. The 1497 preface also states that the work is divided into four books, but this division is neither promised nor performed in most of the manuscripts. Two seem to go no farther than where the third book ends in the 1497 edition, and two others give the first few chapters of its fourth book as a separate treatise on fevers.[1] Indeed the colophon to the 1497 edition states that Peter's treatise on fevers has been added to the *Thesaurus pauperum*. In the 1578 edition instead of four books we find simply eighty-five headings representing as many diseases. Some manuscripts also have tables of contents. Royal 12 B III gives but fifty-two headings, ending with quartan fever, while Additional MS. 32,622 and Harleian MS. 5218 sometimes have more and sometimes fewer headings than the 1497 text, which has 21, 18, 19, and 20 chapters respectively in its four books. The other manuscripts which I have seen have to a considerable extent the same headings, and still more so the same matter, but the order varies somewhat.

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[1] Gilbert of England's *Compendium* adopted essentially that order.

Emphasis on occult virtue.

Returning to the preface, we may note that the author counsels the reader not to despise what he reads because it is unfamiliar to him, and also not to apply the remedies before carefully considering the nature of the disease and the condition of the patient. "And let him study diligently to learn the natures and constitutions and substances of things, and as far as he can the occult virtue of particular things."[2] Otherwise it will be a case of blind leading blind. We have already seen that in addition to this profession of belief in occult virtue of particular objects some manuscripts, though hardly the oldest or most reliable ones, assert further that ligatures are not superstitious but act directly, especially if a right foot is bound on the right foot, or a male animal on a man.

Authority and experiment.

The preface also informs us of the sources whence the work has been compiled. These are "the books of the ancient philosophers and masters and of modern experimenters." The author has tried either to present their views in their own words, or to express their precise meaning in other words of easier comprehension, so that if you had their books at hand you would find nothing other than what he sets down here, and so that in perusing his book you may seem to read the originals. The mention of "modern experimenters" is a foretaste of the "experimental" character of the *Thesaurus pauperum.* In some manuscripts it is called a *Book of Experiments* or a *Summa* of medicinal experiments, and it is sometimes included in collections of expressly experimental works. One reason for this is the common medieval use of the word "experimentum" for almost any medicinal recipe or remedy, but another reason is that Peter's remedies are rather empirical in character. And as early as Galen's time the Empirics relied partly for their experiences upon the statements of past authors. Moreover, we meet throughout the *Thesaurus pauperum* with assurances that this or that has been experienced, or that experts or "Experimenter" have said so, or even that "I have experienced this." [1] These uses of the first person are often probably copied from Peter's authorities, but they later came to be regarded as his own experiences, since the 1578 edition describes the *Thesaurus pauperum* in the full title as "an empirical work from all sorts of authors and his own experience."

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[1] See also CLM 457, 15th century, fol. 112-, De febribus. Sunt aliqua capitula ex thesauro pauperum Hispani Petri.

[2] Sloane 521 and Addit. 32,622 omit "occult."

Some of his authorities.

Among his authorities Peter makes much use of recent works and writers, such as Constantinus Africanus and Platearius and the *Antidotarium* of Nicholaus, Walter and Richard and Roger, *Experimentator* and *Lapidarius* and *Liber de natura rerum,* Gilbert of England and Albertus Magnus. He of course utilizes such Hebrew and Arabic medical writers as Isaac, Rasis, Haly, and Avicenna. It is worth noting as a hint of the superstitious character of parts of his work that he cites the Kiranides a good deal.

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[1] Even in an early MS like Sloane 477 we find the first person used a great deal and experience or "experiments" often mentioned.

Galen and "Dyascorides"—often pseudo, Pliny and Esculapius, are of course not forgotten.

Parts of animals: suspensions.

Much use is made of parts of animals, and perhaps especially of those least to be mentioned. Less nauseating examples are, among many similar parts of animals prescribed for epileptics, the liver of a vulture drunk with its blood for nine days, or the gall still warm from a dog who should have been killed the moment the epileptic fell in the fit. This last is borrowed from Gilbert. Portions of the human body, too, are employed; for instance, burnt human bones or the tooth of a dead man. Suspensions from the neck of such objects as the hairs of a dog or a cabbage root are also in favor.[1]

Remedies for toothache.

Selection of a few details from two or three specimen chapters will further illustrate the nature of the contents. For toothache is recommended touching the ailing tooth with one from a corpse, holding in the mouth violets cooked in wine, holding a grain of opium between the teeth. Other remedies are vinegar in which a root of jusquiam has been boiled, deer horn burnt until it whitens and dries, and a powder made from dogs' teeth. Cavities may be filled with the brain of a partridge or crow's dung. The latter "breaks the tooth and removes pain." A tooth may be easily extracted by touching it with dog's milk or applying a hot root of jusquiam to its roots. But in the latter case beware not to touch the other teeth or they will fall out too.[2] These remedies are, however, mild indeed compared to the treatment for toothache prescribed by Pliny in two chapters of his *Natural History*.[3] Nor do I find in those chapters a passage ascribed to Pliny in the *Thesaurus pauperum*, in which one is directed to dig a root without use of iron, touch the ailing tooth with it for three days, and then replace it where one has dug it, after which "that tooth will never ache again."

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[1] Sloane 2479, fol. 37v, fol. 14r, fol. 13v; and in other MSS.

[2] These remedies for toothache will all be found in Sloane 477 and 2479, Addit. 32,622, and Royal 12-B-III, as well as in the 1497 edition.

[3] 28, 49 and 30, 8.

Prescriptions for epilepsy.

For epilepsy besides parts of animals and suspensions already mentioned, "Experimenter says and I have heard from experts that eating a wolf's heart cures." [1] Or one may try the following experiment: Take a frog and split him down the back with a knife, and extract his liver and wrap it up in a cabbage leaf, and reduce it to a powder in a sealed pot, and give it to the epileptic to drink with the best wine. "And if one frog does not cure him, give him another, and so on until he is cured; and don't doubt concerning the cure, for he will be cured beyond a doubt." [2] From Constantinus and Walter [3] is repeated the cure of an epileptic child by bringing him to church on certain days and having him hear mass and having the priest read over him the Scripture about this sort of demon not being cast out except by fasting and prayer. Most of the manuscripts also state that one who carries with him the names of the three kings who adored Christ will be free from epilepsy, and some give their names, Jasper, Baltaser, Melchior.[4]

Against sorcerers and demons.

Under the caption of remedies for witchcraft and possession by demons are found such procedures as smearing the walls of the house with the blood of a black dog or burying a reed filled with quicksilver under the threshold. A recipe to rescue a patient from infatuation in love produced by sorcery is hardly translateable, but affords too good an example of sympathetic magic or of human psychology to be omitted entirely. "Si quis ad aliquam vel aliquem nimis amandum maleficiatus fuerit, tum stercus recens illius quem vel quam diligit ponatur in ocrea vel in calceo dextro amantis, et calciet se et quamprimum foetorem sentiat, maleficium solvetur." It is also stated that wearing the heart of a vulture makes one popular with all men and very wealthy, and that by vivisecting the bird hoopoe and eating its still palpitating heart one may learn the future and all secrets concealed in men's minds.[1]

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[1] Sloane 477, fol. 9r.

[2] Sloane 2479, fol. 14v; Addit. 25,000, fol. 79v; Addit. 32,622, under the heading *"De spasmo."*

[3] Sloane 477, fol. 10r does not cite Constantine and Walter, but other MSS do.

[4] Sloane 2479, fol. 14v; Royal 12-B-III, fol. 19v; Addit. 25,000, fol. 79v; Harleian 5218.

De morbis oculorum.

Very similar to the remedies of the *Thesaurus pauperum* are those in Peter's treatise on diseases of the eyes.[2] The works are further alike in being compilations and yet experimental or empirical. Peter states that he has collected his material on eye diseases from many books at the urging of a disciple,[3] and that it is based upon reason and experience. Of one recipe for removing ingrowing eyebrows he says, "I have tested this with my own hands"; and he cites as an experiment of Rasis the trite prescription of using the blood of a bat to prevent eyebrows or lashes which have been plucked out from growing again.[4] Millot-Carpentier [5] has already given a number of these eye-cures, bringing out chiefly the great use of parts of animals, which we have already remarked in the case of Gilbert of England. We may further note a bit of astrology. Peter first makes the general assertion that the human body is subject to the planets and signs,[6] and later in describing the eye notes that it has seven tunics or humors covering it like the seven planets. There is also, as in the *Thesaurus pauperum,* some use of Christian incantations. To remove a fistula from the eye, besides using the blood from a cock's crest and pulverized snake-skin one should bind the leaf of an herb about the patient's foot and say, "As Christ descended from heaven into the Virgin's womb, so may the fistula descend from the eye to the foot."[1] This is of course also an example of the magic transfer of disease.

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[1] All the items mentioned in this paragraph are found in the early MS Sloane 477 as well as in other MSS. In a fifteenth century MS at Florence (Ashburnham 143, fols. 113-14), this chapter appears separately as, "*Capitulum pulcrum pro maleficiis malis*" and under the further sub-titles, "*De hiis qui maleficiis impediti cum uxoribus cohire non possunt. Pro maleficiis destruendis secundum magistrum Petrum Yspanum.*"

[2] For the *De morbis oculorum* I have used two MSS. in the British Museum; Sloane 1214, 15th century, fols. 38-46, and Sloane 2268, 14th century, fols. 52-59. I presume that Gonville and Caius 379, 13th century, fols. 142-49, "Secreta mag. Petri yspani ad oculos. In nomine summi opificii / acceptis de pectine matris," is the same work.

[3] Sloane 1214, fol. 38r; Sloane 2268, fol. 52.

[4] Sloane 2268, fol. 54v.

[5] *Op. cit.* (1901).

[6] Sloane 1214, fol. 38r.

Summa de conservanda sanitate.

A third treatise exists under Peter's name in a British Museum manuscript and is called a "Summa concerning the preservation of health and those things which assist and harm it."[2] This work opens in a more self-confident and flamboyant style than the other treatises where Peter spoke of himself in a self-depreciatory manner. Now after a few lines of pious introduction we read, "Let the Jews blush, the Saracens be put to confusion, roving practitioners desist, old enchantresses be dumb, and empirics and methodics keep silence. Let rational physicians rejoice and those descendants of the medical art who employ both reason and experience. I, master Petrus Hispanus, a native of Compostella, have pursued my education (*expertus . . . alumpniam*) in all Italy, Burgundy, Vienne, Provence, Gascony, and certain parts of Spain. Certain useful natural phenomena which are not found in the bosom of the art of medicine I have discovered by labor, vision, chance, experience, and genius to be both useful against diseases and the causes of diseases; and I have demonstrated certain instructive experiments for conserving the safety of the human mechanism, and I have experienced that all things from the eighth sphere to the earth's center are governed by the law of reason (*veridica ratione habentur*)." At first, however, the treatise consists of general rules and precepts for guarding one's health rather than experiments or recipes. Astrology comes in again in the statement that the motion of the superior bodies is one of the causes of the shortening of human life. Presently the author considers different parts of the body in turn, as the brain, eyes, ears, teeth, lungs, heart, stomach, liver, spleen, and feet, and lists things which are good and bad for each. Things which harm the brain,[1] for example, are quicksilver, the cerebellum of all animals except the dog and the fox, fetid odors, gluttony and drunkenness, sleeping immediately after eating—if the brain is weak, bathing after eating, turbid air, worry over temporal affairs, eating with bent head, and eating a great deal of fish or milk, cheese, unripe fruit, and nuts. Among things beneficial for the eyes frequent washing of the feet is suggested.

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[1] Sloane 2268, fol. 54v. Millot-Carpentier presumably has this passage in mind when he says, "Il connaissait la fistule lacrymale qu'il soignait . . . par les exorcisms."

[2] Royal MS. 13-A-VII, 15th century, fols. 149r-153v. "Explicit summa magistri p. de conservanda sanitate et de his quae conferunt et nocent. Finito libro reddetur gratia Christo amen. Rogatis deum pro anima magistro qui hunc librum composuit. Explicit liber." See also CLM 14574, 15th century, fol. 117. Magistri Petri liber de conservanda sanitate, "Erubescant Judei confundantur Sarraceni."

A Marvelous Treatise on Waters.

A Marvelous Treatise on Waters which master Petrus Hispanus composed with natural industry guided by the intellect is found in a number of manuscripts. Sometimes it appears to be the closing part of his treatise on diseases of the eyes,[2] and its first item is "a marvelous water to preserve and clarify the sight." But it also is found as a separate treatise, in which directions are given for distilling various liquids, which in at least one manuscript are accompanied by two figures of chemical apparatus.[3] In another manuscript the word *philosophus* is substituted for *master Petrus Hispanus* in the title given at the beginning of this paragraph, but the treatise is presumably the same.[4] In this case, at least, it seems to include exactly twelve waters [5] and so to conform to other medieval books *Of twelve waters*, of which we treat further in another chapter.[1] Also its last two "waters" are an elixir of life and alcohol.[2] If Peter of Spain came from Compostella, he may have had something to do with a *Book of Compostella, which treats of many waters and of many oils and of many salts of great virtue.* However, Brother Bonaventura, a Franciscan, is said to have composed the book in the convent of the Brothers of St. Mary in Venice.[3]

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[1] Cap. 1, fols. 150r-v.

[2] Sloane 2268, 14th century, fol. 52-, De morbis oculorum; fol. 56r, "Tractatus mirabilis aquarum quod composuit m. p. hyspanus cum naturali industria secundum intellectum"; fol. 59r, "Explicit secretum magistri P. hys. quod fecit pro amico suo ad oculos."

BN 6957, 15th century, # 2, Tractatus mirabilis aquarum quem composuit Petrus Hispanus cum naturali industria secundum intellectum. Explicit secretum magistri Petri Hispani de oculis, (as described by Renzi, V, 122).

BN 7349, 15th century, # 2, is the same treatise.

[3] Additional 32,622, early 14th century, fol. 95r, "Actus mirabilis aquarum quas composuit Petrus Hispanus cum naturali industria."

Egerton 2852, 14th century, fols. 1-5, "de aquis," is very similar in contents to Addit. 32622.

[4] Digby 147, 14th century, fols. 104r-105v, "Tractatus mirabilis aquarum quem composuit philosophus naturali industria secundum intellectum." It opens, "Aqua mirabilis valet ad visum conservandum."

[5] Namely: 1 *aqua mirabilis ad visum conservandum et clarificandum,* 2 *aqua preciosa de radicibus,* 3 *aqua preciosa de seminibus,* 4 *aqua mirabilis per quam facit mistica sive mirabilia medicus,* 5 *aqua salicis,* 6 *aqua aromatica,* 7 *aqua qui dicitur lac virginis,* 8 *aqua tartari,* 9 *aqua de sale gemme,* 10 *aqua copose,* 11 *aqua vite,* 12 *aqua ardens.*

Other works ascribed to him.

A *Rule of Health*[4] and a *Rule of Safety through all the months,*[5] which are ascribed to Peter in still other manuscripts, very likely have some connection with the above-mentioned *Summa de conservanda sanitate* or with the *Letter to Frederick on the Rule of Health* which has also been mentioned earlier in this chapter. A treatise on anatomy is attributed to Peter in an Italian manuscript,[6] and a *Book of Life and Death and of the Causes of Longevity and Brevity of Life* is listed as his in an Oxford manuscript.[7] Perhaps the shortest work ascribed to him is one of seven verses on rain.[8] Commentaries by him on one or more of the following works are contained in a manuscript at Paris:[9] the *Introduction* of Johannitius (Honein or Hunain ibn Ishak) to the *Ars parva* of Galen, the *Prognostics* of Hippocrates, Philaretus concerning the pulse, Theophilus on urines, the *Aphorisms* of Hippocrates, the *Microtegni* itself. A *Liber naturalis de rebus principalibus naturarum* is ascribed to Peter in a Vienna manuscript.[10]

[1] See below, pp. 797-8.

[2] I regret that I have not been able to examine and compare this and the other MSS of the treatise more closely in order to ascertain how far their texts are identical or vary. Some further MSS are:
CU Trinity 1411, early 16th century, fol. 131, *Aqua mirabilis Petri Hispani.*
Harleian 1887, 16th century (?), *Petrus Hispanus, mirab. aquar.*

[3] Assisi 292, 15th century, 75 fols.

[4] BN 7446, 15th century, *Regimen sanitatis.*

[5] Harleian 2258, fols. 224v-225v, *regimen salutis per omnes menses.*

[6] Bibl. Palat. Parma 1065, 15th century, fols. 147-53.

[7] Corpus Christi 243, 1423 A. D., fols. 15v-28, "Sicut igitur in negotio nostro de anima . . . / . . . Explicit liber de morte et vita et de causis longitudinis ac brevitate vite magistri Petri Hispani."

[8] Sloane 568, late 14th century, fol. 15v.

[9] BN 6956, 14th century.

[10] Vienna 4751, 15th century, fols. 274-80, excerptus et in fine mutilus.

Commentaries on Isaac's *Diets:* their scholastic method.

We come finally to Peter's Commentaries upon the works of Isaac on *Universal Diets* and *Particular Diets*.[1] They are as full as the *Thesaurus pauperum* was abbreviated and as scholastic and dialectical in form as it was empirical. Where Isaac's text is clear Peter leaves its meaning to the reader's industry,[2] but it suggests to him over a thousand further questions which he takes up one after the other, listing authorities *pro* and *con* in each case and rebutting or reconciling them. Here we see the handiwork of the author of the favorite manual of logic of the later middle ages. The systematic, but abstract, sophistical, and jejune character of this method may be sufficiently illustrated by quotation of the closing passage of the "First Lecture" (*Lectio prima*).[3]

"Next we proceed to the fourth point and inquire whether any food can be found of like nature to our bodies. And it would seem so, since when foods are called temperate and equal, they are not called equal except with respect to the body. But certain foods, such as chicken meat and the like, are called temperate and equal; therefore it is possible to find food of like nature to our bodies."

"Against this three arguments are advanced. The first is that it is impossible to associate or join two different individuals; therefore a plant which grows in the earth and an animal cannot be joined and made one. The second argument is that nothing which is at first contrary and at last similar is of like nature to our bodies; but such is food, according to Aristotle, therefore no food is at all like. The third argument is that nothing far removed from human nature in constitution and composition and species is in any way like human nature. But all food is of this sort; therefore no food at all resembles the nature of our bodies, which we concede.

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[1] Printed in the Lyons, 1515 edition of Isaac's works: fol. xir, *Commentarium singulare doctissimi viri Petri hispani olim pontificis maximi Johannis vicesimiprimi super librum dietarum universalium Isaac Incipit;* fol. ciii, *Apollinee artis monarche Ysaac filii adoptivi Salomonis regis Arabum diete particulares cum uberrimis excellentissimi viri Petri hispani commentariis.*

[2] *Ibid.*, fol. 12r.

[3] *Ibid.*, fol. 14v.

"But it should be said anent these opposing arguments that 'like' may be understood in two senses. Either it means alike in all respects, and so no food is like. In the second sense, it means that it makes no manifest impression on the body, and in this sense some foods are called of like nature, such as chicken."

"Next it is asked whether human flesh is nourishing, since nutriment goes by likeness. And it would seem so, for Isaac says that man is not nourished by the elements, since he is too far removed from them. Therefore that flesh which approaches closest to human nature should be the most nutritious. But this is human flesh; hence human flesh should be very nutritious. Here is another argument. Nutriment is from likeness, and from equal nutriment comes a well-balanced state of health; now the human constitution is especially temperate and well-balanced; therefore it requires temperate and equal food, and such, some agree, is human flesh. We, however, call it the worst sort of nutriment for two reasons: one, its corrruptibility; the other, its excessive unctuosity. For as the flesh of the body endures by virtue of the presence of the soul, so after the spirit's departure the flesh becomes moist, vile, and fetid; and herein lies the solution of the difficulty, since if it is temperate, it has this property from the soul while it exists in the body."

As to what the effect would be of eating men alive, Peter does not state. His argument may have possessed an additional interest for his own time from the possibility of applying it in theological as well as medical matters,—for example, the sacrament of the Eucharist.

Their questions concerning nature.

Many of the questions raised by Peter are concrete enough, however, and supply, not only some definite information on the history of domestic science and of the medieval table, but also interesting illustration of the scope of that medieval curiosity concerning nature to which we have more than once adverted. Such questions continue the type of natural science of which the *Problems* of Aristotle and the *Natural Questions* of Adelard of Bath are earlier instances.

Those of Peter are the more impressive in that some of them are far removed from the subject of diet at all strictly interpreted. The following is a list of such representative questions picked out here and there throughout the commentaries on both the works of Isaac on diet.

Can natural death be retarded?

Is a well-balanced constitution the best preserved, or is it easily overcome by the causes of disease?

Is bad food more injurious than bad air?

Why do we employ foods hot in the fourth degree and not those cold in the same degree?

What should be the diet of those taking mental exercise, like students?

Why is man less hairy and of weaker constitution than the brutes?

Why does nature sustain a multitude of medicines, but not of foods?

Are medicines always contraries?

How can animals who eat poisons be food for men?

Why in some foods is the liquid substance of the same nature as the solid, and in others not?

If the spleen causes laughter by purifying the blood, why isn't love caused by the gall-bladder?

Why are the droppings of birds of prey white, of others not?

Does the blood alone nourish us?

How do sweet things sour on the stomach?

Should wine be drunk before or after eating, and immediately following or long afterwards?

Is water of more aid than wine in the process of assimilating food?

Which satiety is sooner removed, that from fats or from sweets?

How do salts possess the virtue of laxatives?

Why are fish not given in acute fevers?

Why are compound foods more often injurious than compound medicines?

Why are some plants cold and wet when young, hot and sharp when old?

Is humidity the formal principle of tastes?

Is fruit wholesome?

Why do some plants bear fruit twice a year?

Why does a branch cut from a plant and placed in earth live, while the severed limb of an animal will not live?

Why are animals soft in infancy, and fruits hard?

What part of water is more truly water: top, bottom, or middle?

Is cow meat better eating than ox meat?

Is the flesh of female animals moister?

Why in hot regions are the brutes large but the men small, and in cold countries the contrary?

Is pork better in summer?

Is meat cooked in a pie good?[1]

Why are the ears of all animals save men and apes in continual motion?

Why do sparrows cure epilepsy when they are subject to the disease themselves?

Why are pigs' intestines the best of animals that walk and geese's intestines of those that fly?

Why a small hen lays more eggs than a large one?

Are eggs or meat better for convalescents?

Why is white of egg used for wounds?

Is goats' milk the best?

Is human milk subtler than asses' milk?

Why do these things go together:—having large flanks and belly, ruminating, lack of teeth in the upper jaw, coagulation of the milk, having horns?

Is butter of a hotter nature than oil?

Why salt water fish do not have salt flesh?

Why the dolphin and whale have true blood, albeit they are fish?

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[1] *"An caro cocta in pasta sit bona?"* Peter thinks that it is *pessima,* because the pastry prevents the noxious fumes and humors of the meat from escaping, but he adds, *"Contrarium facit vulgus."*

Why there are larger fish in salt water than fresh?

Are fish fried in meal better than those not?

Should paralytics eat fried fish?

Why should one not eat eggs raw like milk?

Why the flame of fire takes the figure of a pyramid?

Why are springs hot in winter and cold in summer?

Should an interval elapse between the courses of a meal?

Should drink be taken along with one's food?

Should the heartier meal be at mid-day or in the evening?

Why are other animals than man content with one form of food?

Why does human urine enrich vines?

Should fruit be plucked ripe or green?

Are apples good in fevers?

Why is wine (cider) made from apples?

Why does melancholy especially excite the appetite?

Why do the boxwood, white-fir, and laurel trees retain their foliage a longer time than others?

Why in the boxwood, laurel, and olive are the leaves pointed, in the poplar and other trees wide?

Is it beneficial to strew myrtle leaves in the sick-room?

Why is oil best at the top, honey at the bottom, wine in the middle of the cask?

Are fungi plants or something between earth and plants?

Why the weasel seeks rue and rubs itself with it when it intends to fight a snake?

Why pepper is good for dimmed eyes?

Why the water in the sea does not grow less?

Why the horse, mule, and ass neither nourish man nor harm him, if he eats them?[1]

Why castration improves the conduct of beasts, makes men worse?[2]

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[1] An interesting passage, which seems to indicate that despite frequent famines the medieval poor were seldom reduced to horse-meat. Peter's explanation is that these animals are not poisonous, but that nature designed them for man's service, not his nutriment.

[2] On this point Peter does not seem to be in agreement with some modern sociologists.

Is raw cheese better than cooked, and solid cheese or cheese with holes in it?

Why are fools so fond of cheese?

Why have birds but two feet and no teeth?

Which is more nourishing, the white or the yolk of an egg?

Why travelers should eschew fish?

Whether the water that we drink is the element?[1]

Which is better, standing or running water?

Why wine affects the tongue more than the other members?

Absence of astrology and occult virtue.

Some of the questions which Peter raises one might expect him to solve by an appeal to occult virtue, sympathy and antipathy existing between things in nature, or the superior influence of the stars. This, however, he almost never does; his reasoning is based rather on the prevalence of the four qualities, hot and cold, dry and moist, in natural objects. Thus the property of dove's blood of removing spots from the eye is attributed to its heat and humidity, not to any occult power.[2] And sparrows, although epileptics themselves, are said to cure epilepsy because they are very hot and dry and consume the humors or vapors which cause epilepsy, not by antipathy or because like cures like.[3] Even less does one note any instances of ligatures and suspensions, characters and incantations. One or two passages show, however, that Peter believes in occult virtue and the rule of the stars. He states that in addition to the four simple elements "there is another simplicity . . . namely, from qualities, and it is not in the elements but in the celestial bodies." [4] And in his prologue to the *Particular Diets* he affirms that celestials are the cause of inferiors and quotes the words addressed by God to the stars in Plato's *Timaeus,* "O gods of gods, whose father and creator I am, by your nature you are dissoluble but by my will indissoluble," to prove how much more corruptible inferior bodies are.[1]

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[1] Peter of course answers in the negative.

[2] fol. 145v.

[3] fol. 78.

[4] fol. 150v.

Incorrect ideas about Nature.

Despite the almost complete absence of superstitious practices and of astrological and magical doctrine from the *Commentaries on Isaac* it is of course true that Peter harbors many incorrect notions such as that fish lack bones and that hot water freezes harder and quicker than cold.[2] This last, however, he supports by the authority and arguments of Aristotle and Avicenna. Peter also throughout the work displays faith in the validity of compound medicines, although he raises the suggestive question, why compound foods are more often injurious than compound medicines. He also accepts various stories of animal remedies and sagacity for which he finds support in Aristotle's *History of Animals,* such as that the serpent eats fennel to restore or sharpen its sight,[3] and that the bone in the heart of the stag is especially beneficial for heart disease because "the stag is very ingenious and astute and so eats potent herbs which especially affect the heart like parsley and origanum," and from these the bone forms.[4] In explaining why deer shed their horns and hide them, Peter incorrectly makes Aristotle say that they secrete the right horn with more care, whereas the *History of Animals* states, "It is said that no one has ever seen the left horn, for he conceals it as if it had some medicinal (or, magic) power." [5]

Reason and experience.

Finally, despite the scholastic form of Peter's Commentary, it contains a long passage on the importance of experimental method or "the way of experience" (*via experimenti*),[6] which it couples with "the path of reason" (*via rationis*) as the two methods by which dietary science may be investigated. First Peter distinguishes between the two, then shows the necessity of the way of experience, and third that it can and should be confirmed by reason. Galen says that experience is weak without reason, and so is reason when not joined to experience. Some say that reason should precede experience, that first we should seek rationally, then test by experience. In any case the way of experience proceeds through effects, the way of reason through causes. The one method is inductive; the other, syllogistic; the one based on immediate effects, the other on mediate effects. "Experimental method pays no attention to causes; rational method considers causes and principles; experience makes use of the senses; reason, of the intellect" and arguments.

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[1] fol. 103r.

[2] fol. 149r; fols. 150v-151r.

[3] fol. 127r.

[4] fol. 136r.

[5] fol. 135v, and *De animal. hist.* ed. Dittmeyer (1907), p. 362, lines 29-30. λέγεταιδ’ ὡς ἀριστερὸν κέρας οὐδεὶς πω ἑώρακεν ἀποκρύπτειν γὰρ αὐτὸ ὡς ἔχον τινὰ φαρμακείαν. The last word, of course, suggests either a drug or poison, medicine or charm.

[6] fols. 19v-20v; see also fol. 11v.

Via experimenti.

After listing various arguments *pro* and *con* as to whether the *via experimenti* "is of art and in art, or precedes art," Peter gives his solution to the effect that *experimentum* is threefold. As a method of attaining knowledge it antecedes all arts and sciences. As a method of making known the objects of scientific inquiry, it is a part of science. As an application of scientific doctrine to practical life and industry, it follows science. Furthermore, experience "may proceed regularly through science and doctrine and in this way it can be rational." Or it may be irregular and not syllogistic in method. The experimental discoveries of brutes, as when the serpent restores its sight with fennel, come to them from nature, but ours are acquired by art and confirmed by reason, although man too possesses the experimental instinct. Peter further distinguishes the experiences of rustics, which are unregulated by reason, from the experiments of skilled men which are regulated by reason. Moreover, "experiences are not without their reasons, and idle is the experiment which does not rest on reason." Finally, Peter gives six conditions requisite in medical experimentation which are somewhat similar to the seven conditions stated by his contemporary, John of St. Amand. First, the medicine administered should be free from all foreign substance.[1] Second, the patient taking it should have the disease for which it is especially intended. Third, it should be given alone without admixture of other medicine. Fourth, it should be of the opposite degree to the disease. Fifth, "we should test it not once only but many times." Sixth, "the experiments should be with the proper body, as on the body of a man and not of an ass."

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[1] " . . . medicina sit tuta ab omni qualitate complexionali."

Question of Peter's relation to Roger Bacon and Galen.

Peter's discussion of the *via experimenti* is in several respects similar to Roger Bacon's discussion of experimental science, but is probably quite independent of it. Peter died before Roger in 1277, and his *Commentary on Isaac* was probably composed before the works which Bacon addressed to the pope in and around the year 1267. The influence of Galen, who had discussed the part played by reason and experience in his own work on food values, upon Peter is fairly evident.

John of St. Amand on medical experimentation.

John of St. Amand, to whose similar conditions for medical experimentation we just alluded, was a canon of Tournai who seems to have written a little later than Peter, since he describes the death from vomiting of a bishop of Tournai which took place in 1261.[1] It is in his commentary on the *Antidotarium* of Nicolaus that John gives his seven conditions for medical experimentation. After having said that on account of the scarcity and incompleteness of experience, we should sometimes learn the virtues of simple medicines "through doctrine," John for a page or two discusses other matters, but then reverts to the subject of experimentation. A medicinal simple, he says, may be known by two methods, "the way of experience and the way of reason." "And because the principles of experience are better known to us than the principles of reason, let us first inquire concerning the knowledge of medicinal simples by the way of experience." He goes on to say that experience is twofold as it is supported or not supported by reason. If unsupported by reason experience or experiment is timorous and fallacious. As for experience supported by reason, it should conform to these seven requirements.[1] First, "the medicinal simple which is being tested should be pure and free from every extraneous quality, lest by such extraneous quality the proper operation of the medicine be impeded, and in consequence experimental knowledge." [2] Here the use of the adjective, "experimental" is interesting. Second, the experimentation should be with a simple and not a complicated disease.[3] Third, the simple should be tested in two contrary types of disease, because sometimes a medicine cures one disease by its "complexion" or elemental properties and another by its occult virtue. Thus scammony cures both quotidian and tertian fever; the first because scammony is of a hot nature; but the second by its occult virtue and not because scammony is of a cold nature, for it is not.[4] Fourth, the virtue of the medicine should correspond to the quality of the patient. Fifth, essence and accident should not be confused; water, for example, may be heated, but is not of a hot nature.[5] Sixth, the experiment should be often repeated.

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[1] On Jean de Saint-Amand see HL XXI, 254-66; J. L. Pagel, *Die Concordanciae des Johannes de Sancto Amando*, Berlin, 1894, and *Nachträge zu den Concordanciae des Johannes de Sancto Amando*, Berlin, 1896. For the *Expositio in Antidotarium Nicolai,* I have followed the text in *Mesuae medici clarissimi opera,* Venice, 1568; but there are earlier editions, such as Venice, 1497, and Lyons, 1533.

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[1] *Expositio in Antidotarium Nicolai* (1568), fol. 231, "Sed medicina simplex duplici via cognoscitur scilicet via experimenti et via rationis. . . . Et quia principia experimenti sunt nobis magis nota quam principia rationis, ideo prius inquiramus cognitionem simplicium medicinarum via experimenti . . . duplex est experimentum . . . vallatum et non vallatum ratione, tunc ipsum est timorosum et fallax si non sit vallatum ratione. . . ."

[2] *Ibid.*, "Oportet ut medicina simplex quae experiatur sit pura et munda ab omni extranea qualitate, ne per illam extraneam qualitatem impediatur propria operatio medicinae, et per consequens cognitio experimentalis." This is the same as Peter's first condition. Also as the passage from Galen's *Medicinal Simples*, II, 5, quoted in John's *Concordances*, "Oportet quod res quae experitur sit pura et denudata ab omni qualitate accidentali. . . ."

[3] I do not note this condition among Peter's nor in the *Concordances*.

[4] "Oportet quod medicina simplex experiatur in duabus contrariis aegritudinibus diversis, sicut scamonea in quotidiana et tertiana, ipsa enim curat quotidianam ex sua complexione, tertianam ex proprietate sua, tamen non sequitur, scamonea curat tertianam, ergo est frigida; sed sequitur, ipsa ex sua complexione curat quotidianam, ergo est calida."

The use of the word "proprietas" for occult virtue is found also in Arnald of Villanova and other medieval writers.

[5] John's third, fourth and fifth conditions do not exactly correspond to any of Peter's, but are contained in the following quotation from Galen (*simpl. med.* I, 2) in the *Concordances*. "Ad hoc

For if a medicine is tested in the cases of five men and has a heating effect upon them all, still that is not adequate proof that it will always have a heating effect, for they may have all been of a cold or temperate constitution, whereas a man of hot nature would not be heated by the simple in question. Seventh, the test should be on the human body and in varying states of health. Trying the medicine upon a lion may not prove anything as to its effect upon a man.[1] John seems to have taken his conditions directly from Galen rather than from Petrus Hispanus, since only three of them are identical with Peter's, whereas all but one occur in his own *Concordances* from Galen's works.[2] John of St. Amand repeats the experiment with the hazel rod which we have already encountered in William of Auvergne. According to John the two split halves tend to reunite because it is natural for them to be together, but he adds that some old women make use of it with utterance of a useless incantation as a matrimonial charm, asserting that if the halves unite, the marriage will be a happy one.[3]

Natural and occult science in John of St. Amand.

It was not my intention to speak of John of St. Amand further than to compare his remarks on experimental method

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ut res recte experiatur, tria requiruntur: 1m est ut experiatur in re ad quam comparatur, ut helleborus in coturnice non in homine; 2m requiritur ut distinguamus inter opus quod facit res per se et quod facit per accidens; 3m oportet cavere ne complexio actualis obnubilet potentialem et de omnibus his exempla ponit."

[1] "experimentum in corpore humano et primo in temperato, postea in lapso, et postea in aegro." These last two conditions correspond to Peter's last two and are also duplicated in John's *Concordances* from Galen: "Si videris 5 vel 6 homines qualibet medicina mobiles, experimento solo non potuisti certiorare illa medicina omnes homines posse moveri. . . . Oportet cum res experitur ut primo experiatur in corpore temperato et postea in intemperato."

[2] See the foregoing footnotes and Pagel's text (1894), pp. 102-4.

[3] *Expositio in Antidotarium Nicolai,* fol. 268, " . . . et hoc patet per experimentum accipiatur virga coryli recens et scindatur per medium medullae et ponatur frustum unum in manu una et aliud in alia manu, adinvicem coniungentur et hoc est quia unam alteri natum est conjungi naturaliter quia ex eis fiebat naturaliter unum conjunctum, et ideo unum natum est alteri conjungi excitatum per virtutem alterius. Et per illud faciunt vetulae carmen suum in matrimonium: dicunt enim quod quando aliquis desponsat aliquam, quod illae virgae coryli si conjungantur matrimonium erit ad bonum, si non, non: sed dicunt carmen aliquid operari ad hoc quod nisi dicerent, conjungerentur tamen sive ad bonum sive ad malum."

with those of Petrus Hispanus, but the *Histoire Littéraire* has already presented some specimens of his views, which it will be worth repeating to show that his experimental tendency has the same accompaniment of mingled credulity and scepticism and of occult science and signs of magic as we have noted in other cases. Thus he rejects the story that the beaver castrates itself to escape the pursuit of hunters on the ground that the animal has not that much sense, but believes that beavers enslave one another. From the fact that herons are subject to diarrhoea he argues that men with long necks and legs should not resort to purgatives, and he states that pearls comfort the heart by similarity, since they are hard like the heart. He enters into long and obscure explanations how it is that application of the flesh of a snake extracts the venom from its bite, and "is not exempt from astrological ideas." [1] But the writings of John of St. Amand have carried us well along into the second half of the thirteenth century; in the next chapter we must turn back to a man whose literary activity began in the first half of that century, Albertus Magnus.

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[1] HL XXI, 263-5.

APPENDIX I

SOME MANUSCRIPTS OF THE THESAURUS PAUPERUM

I have examined the following MSS of the work in the collections in the British Museum. As usual, the dating of the MSS is not my own, but either that given in the catalogues of the collections or in the MSS themselves.

Sloane 282, quarto, 15th century, fols. 87-105, Petri Hispani, postea Johannis Papae XXI, Thesaurus pauperum.

Sloane 284, 15th century, fols. 129-174. "Incipit liber qui thesaurus pauperum nominatur compositus a magistro P. Hispano Papa Johanne postmodum."

Sloane 477, dated Sept. 30, 1309. Fol. 79r, "Explicit thesaurus pauperum ad honorem dei et hominum ipsius operis exigentium. Anno domine mill'o tricentessimo nono die tricessimo mense septembris hoc opus complevi scripsi presbitur N. De. Machia Anconitana hunc scripsit librum cui Christus filius dei et virginis matris marie det sibi gratiam consolationem anime et corpori. Amen." Then in different ink is added, "Explicit thesaurus pauperum vel summa experimentorum medicinalium magistri petri Hispani." This MS, which seems as early as any that I examined, is written on small pages in large print-like letters. The red ink of the text has faded and is accompanied by numerous notes in small black writing.

Sloane 521, 14th-15th century, fols. 46-74. "Explicit summa Petri Hispanensis experimentorum medicinalium, cujus libri posuit nomen thesaurus pauperum. Amen. Amen."

Sloane 1754, 14th century, fols. 8-13. "Flos florum experimentorum thesauri pauperum a magistro Petro Yspano" etc. A collection of excerpts from the work; see also Sloane 357 and 405, both 15th century.

Sloane 2479, 14th century, fols. 10-41. At fol. 38v, "Explicit thesaurus pauperum"; at fol. 41v, "Expliciunt febres et thesaurus pauperum magni petri hispani quondam pape."

Additional MS 22,636, fols. 23-35r (and not, as the catalogue and Scott's Index say, to fol. 47, since a work on Phisionomia and some extracts from Thomas of Cantimpré on seals and gems intervene.) "Explicit liber qui dicitur tesaurus pauperum."

Additional 25,000. This MS resembles Sloane 2479 closely in its arrangement: at fol. 94r, "Explicit liber pauperum"; at fol. 96v, another Explicit follows the discussion of fevers.

Addit. 32,622, early 14th century, fols. 116-177. "Summa experimentorum medicinalium Magistri Petri Ispaliensis, qui dicitur liber nomine thesaurus pauperum."

Royal 12-B-III, 14th century, # 2.

Harleian 5218. "Petri Hispani Thesaurus pauperum, Liber medicus cum complexionibus simplicium medicinarum, secundum Gallianum de Sancta Sophya Phisicum."

I have not been able to consult the following MSS in the Amplonian collection at Erfurt, but mention them as of early date and not listed by Stapper.

Amplon. Octavo 62, early 14th century hand, fols. 124-165, Rubr. "Incipit thesaurus pauperum editus per Iohannem papam."

Amplon. Quarto 193, end of 13th century to 1362-1364, fols. 2-49. "Incipit liber experimentorum, qui thesaurus pauperum nuncupatur."

Amplon. Folio 271, 13th-14th century (Schum omits this in the index to his catalogue of the Amplonian collection).

Amplon. Folio 303, fols. 147-63.

Another early copy is contained in a miscellany compiled at Bologna in 1326: Wolfenbüttel 4504, fols. 106-31, Explicit summa medicinalis Magistri Petri Yspani, que dicitur thesaurus pauperum.

A few other MSS of the Thesaurus pauperum are:

Ste. Geneviève 2235, 14th century, "Incipit Summa experimentorum medicinalium magistri Petri Hispani, que dicitur thesaurus pauperum."

Ste. Geneviève 2237, 18th century, fol. 57, "Incipit pauperum thesaurus summi medicorum monarchae D. Joannis XX (XXI) pontificis maximi cui Petro Hispano ante nomen erat in quo curandorum morborum et theoresim et praxim absolutissime comperies."

BN 8654, 14th century, perhaps 1306 A. D.

Trivulz. 657, 14th century.

Turin F-V-25, 14th century, fols. 93-177.

Naples VIII-G-100.

Perugia 1227, 14th century, 50 fols., no author named.
Florence II-vi-62, 14th century, in Italian.
Wolfenbüttel 3050, 14th century, no author named.
CLM 438, 14th century, fols. 1-84; 321, 15th century, fol. 107-; 8742, 15th century, fols. 152-68.

CHAPTER LIX

ALBERTUS MAGNUS

Bibliography

His own writings—His life—His relations to natural science.

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V. *Attitude Toward Astrology*

Emphasis on the influence of the stars—Problem of the authorship of the *Speculum astronomiae*—Mandonnet fails to prove Albert hostile to astrology—Nature of the heavens and the stars—The First Cause and the spheres—Things on earth ruled by the stars—Conjunctions—Comets—Man and the stars—Free will—Ptolemy on free will—Nativities—Galen on the stars and human generation—Plato on boys and the stars—The doctrine of elections—Influence of the stars on works of art—Astrological images—Discussion of fate in the *Summa theologiae*—Attempt to reconcile the Fathers with the astronomers—Glossing over Augustine—Christ and the stars—Patristic arguments against astrology upheld, but perhaps not by Albert.

Bibliography Concerning Albertus Magnus

In the following bibliography I include some works that I have not been able to examine and cannot vouch for, and omit others which I have seen but which seemed of doubtful value or treated sides of Albert's personality and writings which have little connection with our investigation, such as accounts of Albert as a saint, or theologian, or metaphysician, or psychologist. Of recent years a bewildering underbrush of German monographs has sprung up concerning Albert as one of the few prominent persons that Germany could claim as its own among the many scholars of the medieval period.

A number of works that do not deal primarily with Albert will be cited in the course of the chapter rather than here, and mention of his individual works and of manuscripts of them will also be found in connection with the following text.

I. *His Own Writings*

M. Weiss. Primordia novae bibliographiae B. Alberti Magni, Paris, 1898.

B. Alberti Magni Opera omnia, ed. Augustus Borgnet, Paris, 1890-1899, in 38 vols. My references are regularly to this edition. Its text, however, has been a good deal criticized.

Of more recent and critical editions of single works by Albert, that of the Historia animalium by H. Stadler from the Cologne autograph MS in Beiträge z. Gesch. d. Philos. d. Mittelalters, vols. 15-16, is the only one of a work with which we are concerned. Stadler attempts to distinguish Albert's additions from Aristotle's text and to trace their sources. German criticism of the genuineness of large portions of the text of Aristotle's Historia animalium has in my opinion been carried altogether too far and based upon the gratuitous assumption that Aristotle would not have said anything superstitious. For recent editions of other single works by Albert see v. Hertling (1914) 23.

Separate bibliographies of printed texts and MSS of certain works of doubtful or spurious authorship ascribed to Albert will be given later in separate chapters dealing with these.

II. *His Life*

Articles in the Histoire Littéraire de la France, XIX, 362-81, in The Catholic Encyclopedia, and by Mandonnet in Vacant and Mangenot's Dictionnaire de théologie catholique.

Petrus de Prussia, Vita B. Alberti Magni, 1621; von Hertling mentions an earlier edition of Cologne, 1496, which I have not seen.

Joachim Sighart, Albertus Magnus: sein Leben und seine Wissenschaft, Ratisbon, 1857. (French translation, Paris, 1862). (English translation by Dixon, London, 1876, is incomplete and garbled.)

N. Thoemes, Albertus Magnus in Geschichte und Sage, Cologne, 1880.

G. von Hertling, Albertus Magnus: Beiträge zu seiner Würdigung, 2nd edition, revised with the help of Baeumker and Endres, Münster, 1914, in Beiträge z. Gesch. d. Philos. etc., vol. XIV.

Paul von Loë, De vita et scriptis B. Alberti Magni, in Annal. Boland., XIX (1900) 257-84, XX (1901) 273-316, XXI (1902) 361-71.

Kritische Streifzüge auf dem Gebiete der Albertus Magnus Forschung, in Annalen d. hist. Vereins f. d. Niederrhein, Cologne, vol. 72 (1902) 115-26.

E. Michael, Albert der Grosse, in Zeitsch, f. kath. Theol., Innsbruck, XXV (1901) 37-; Wann ist Albert der Grosse geboren? Ibid. XXXV (1911) 561-.

P. P. Albert, Zur Lebensgeschichte Alberts des Grossen, in Freiburg. Dioces. Archiv, 1902.

J. A. Endres, Das Geburtsjahr und die Chronologie in der ersten Lebenshälfte Alberts des Grossen, in Historisches Jahrbuch, XXXI (1910) 293-.

Eine beabsichtigte zweite Berufung Alberts des Grossen an die Universität Paris um Jahr 1268, in Hist.-polit. Blätter, vol. 152 (1913) 749-.

Chronolog. Untersuchungen z. d. philos. Kommentaren Alberts des Grossen, in Festgabe 70 Geburtstag von G. Freiherr von Hertling, Freiburg, 1913, p. 96-.

A. Pangerl, Studien über Albert den Grossen, in Zeitschrift für katholische Theologie, XXXVI (1912) 304-31, 332-46, 512-49, 784-800.

P. Pelster, S. J., Kritische Studien zum Leben und zu den Schriften Alberts des Grossen, Freiburg, 1920; I have not been able to procure in time to utilize, but it seems in large measure a re-examination of ground already covered.

III. *His Relations to Natural Science*

E. H. F. Meyer, Albertus Magnus, ein Beitrag zur Geschichte der Botanik im XIII Jahrhundert, in Linnaea, 1836-1837.

F. A. Pouchet, Histoire des sciences naturelles au moyen âge, ou Albert le Grand et son époque considéré comme point de départ de l'école expérimentale, Paris, 1853; pp. 203-320 deal particularly with Albert.

L. Choulant, Albertus Magnus in seiner Bedeutung für die Naturwissenschaften, historisch und bibliograpisch dargestellt, in Janus, I (1846) 152-.

E. v. Martens, Ueber die von Albertus Magnus erwähnten Landsäugethiere, in Archiv f. Naturgesch. XXIV (1858) 123-44.

C. Jessen, Alberti magni historia animalium, in Archiv f. Naturgesch. XXXIII (1867) 95-105.

R. de Liechty, Albert le Grand et saint Thomas d'Aquin, ou la science au moyen âge, Paris, 1880.

A. Fellner, Albertus Magnus als Botaniker, Vienna, 1881.

H. Stadler, Albertus Magnus als selbständiger Forscher, in dem Vordergrund des Interesses gestellt; in Forschungen z. Gesch. Bayerns, XIV (1906) 95-.

J. Wimmer, Deutsches Pflanzenleben nach Albertus Magnus, etc. Halle, 1908.

S. Killermann, Die Vogelkunde bei Albertus Magnus, Regensburg, 1910.

I. *Life*

The leading figure in thirteenth century learning.

At last we come to the consideration of the dominant figure in Latin learning and natural science of the thirteenth century, with whose course his life-time was nearly coincident, the most prolific of its writers, the most influential of its teachers, the dean of its scholars, the one learned man of the twelfth and thirteenth centuries to be called "the Great," —Albertus Magnus. The length of his life and presumably also of his period of literary productivity makes it difficult to place him at any particular point in the century, and from the fact that Vincent of Beauvais and Peter of Spain cite him we might well have placed our account of his works before theirs. He appears, however, to have outlived them both. But it is mainly in order to bring our account of

Albert into juxtaposition with our treatment of the other two great names of Thomas Aquinas and Roger Bacon, to determine whether the *Speculum astronomiae* should be ascribed to Roger rather than Albert, and to treat of books of experiments and magic, that have been ascribed to Albert but are perhaps of somewhat later date, in connection with other similar experimental and occult literature, that we have postponed our consideration of Albertus Magnus until this point.

Albert and Aquinas.

In 1253, the same year that Robert Grosseteste died, four years after William of Auvergne, opened the pontificate of Alexander IV, of which Ptolemy of Lucca wrote: "In his time flourished two great doctors in the Order of Preachers. Doubtless many others were famous during this same time both in life and doctrine. But these two transcended and deserve to be placed before all others."[1] The two Dominicans whom Ptolemy had in mind were, of course, Albertus Magnus and Thomas Aquinas.[2] It is customary and natural to couple their names. Besides being members of the same order, they were master and student; they were also the two scholars of their time who did most to adapt the natural philosophy of Aristotle to Christian use, a fact which in itself suggests their interest in natural science. It may seem strange to us today that two theologians, and even more so two members of an order vowed to asceticism, apostolic poverty, and the maintenance of strict orthodoxy against heresy, should play a leading part in interpreting the ideas of Greek and Arabic philosophers and should display such an interest in natural science. The fact, however, is indisputable. It is to the credit of the medieval church and its religious orders. But it is even more a tribute to the power that philosophy and natural science exercise upon every able mind that really studies them. As for the relations between Albert and Aquinas, it must be added that while the former outlived his pupil, he was born a full generation before him. It was thus Aquinas who profited by and built upon Albert's work.

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[1] *Hist. Eccles.*, XXII, 17 (Muratori, XI, 1150).

[2] Epitaphs of Albert and Aquinas, opening respectively, "fenix doctorum" and "in luctu citharae," are preserved in CLM 19608, 15th century, fols. 219-21. A portrait of Albert is found in CLM 27029, fol. 88, in the midst of a treatise copied in 1388 A. D.

Dates of birth and death.

Ptolemy of Lucca states that Albertus Magnus was over eighty years old when he died in 1280, and that for about three years before his death he largely lost control of his intellectual faculties.[1] That he outlived his pupil Aquinas by six years, and that his writings are cited by other contemporaries who died before he did—Vincent of Beauvais and Petrus Hispanus, are other indications of his longevity. There consequently seems little reason for questioning the traditional date of his birth, 1193, although Pouchet has suggested 1205 [2] and Father Mandonnet, more recently, 1206.[3] The main argument for placing his birth about 1206 is that a fourteenth century chronicler [4] states that he was only sixteen when he entered the Dominican Order, while in the fifteenth century Peter of Prussia asserts that Albert himself used to say that he had been in the Order "from his very boyhood." [5] His birthplace was at Lauingen in Swabia and he was the oldest son of the count of Bollstädt.

Early life.

Albert studied at Padua, where he tells us that in his youth he saw a well which exhaled a deadly vapor,[6] while at Venice he beheld a royal figure painted by nature upon marble.[7] He perhaps entered the Dominican Order in 1222 or 1223. According to Peter of Prussia,[8] a few years later he was made reader or lecturer of the friars at Cologne and "twice gloriously lectured on the *Sentences*." Then he was successively *Lector* at Hildesheim in 1233, at Freiburg, for two years in Ratisbon, and at Strasburg. Albert alludes in his works to a comet which he saw in Saxony in 1240.[1]

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[1] *Hist. Eccles.* XXII, 19 (Muratori, XI, 1151).

[2] Pouchet (1853), p. 210.

[3] In *Dict. Theol. Cath.*, (1909-). Also *Revue Thomiste* V, 95; *Siger de Brabant*, 2nd edition (1911 and 1908), p. 36.

[4] Henry of Hereford, ed Potthast, Göttingen, 1859. Over this point quite a war of pamphlets and monographs has recently been waged.

[5] Peter of Prussia (1621), p. 65, "qui ab ipso puerili aevo ut ipse testatur ad decrepitam usque aetatem iugum Domini mira cum hilaritate in eodem Ordine portavit."

[6] *Meteor.*, III, ii, 12.

[7] *Mineral.*, II, iii, 1.

[8] *Vita Alberti* (1621), p. 90.

Probable early date of some of his works.

Although Ptolemy of Lucca mentions Albert and Aquinas as flourishing during the pontificate of Alexander IV, 1253-1261, much of the former's writing as well as teaching probably antedates this. Presumably he was already famous when young Aquinas came all the way from Italy to Cologne or Paris to study with him about 1244 or 1245. If the *Speculum naturale* of Vincent of Beauvais was written by 1250, many of Albert's writings which it freely cites must have appeared before that date, for instance, the *De anima* (III, 41), *De sensu et sensato* (V. 108), *De somno et vigilia* (XXVI, 23), *De animalibus* (XVII, 71). The treatise on sleep and waking is found in a manuscript written in a French hand in 1258.[2] Even in the treatise on minerals,[3] which has been regarded as written after 1250 because Vincent of Beauvais does not cite it, and in which Albert speaks of having been in Paris as well as Cologne, he also speaks of one of his associates who saw in the possession of the emperor, Frederick II, 1212-1250, a magnet which instead of attracting iron was drawn to that metal.[4] On the other hand, in his work on animals Albert cites the emperor Frederick's book on falcons, so that Albert's treatise on animals was probably not finished until at least the latter part of that monarch's reign.[1] But even Mandonnet who delays Albert's birth to 1206 believes that his first writings date back to 1240 and that his great philosophical works began to appear about 1245. I should be inclined to push these dates back ten or twenty years. Albert was probably teaching at Paris from about 1245 to 1248, in which year he signed the condemnation of the *Talmud* in that city and then became regent of the new school at Cologne established by the Dominicans.[2]

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[1] *Meteor.*, I, iii, 5. See also Ashmole 393, fol. 77, "Cometa" seu "De generatione comete" secundum Januensem, Papiam, et Albertum in summa (an. 1240).

[2] Amplon. Quarto 296.

[3] Although the treatise on Minerals has always been accepted as authentic, since its opinions in connection with magic and astrology are rather extreme, it may be well to list here some early MSS of it. Berthelot (1893) I, 290, regarded BN 6514, written about 1300, as "almost contemporary," but some of the following are older, if the dating in the MSS catalogues is dependable.

CLM 353, 13th century, fol. 55- *Lapidarius*, fol. 69- *liber de mineralibus*.

CLM 540A, anno 1298, fols. 1-106, *libri V mineralium*.

CLM 23538, 13-14th century, 54 fols., *de mineralibus libri V*.

Amplon. Quarto 189, about 1300 A. D., fols. 40-67, *liber de mineralibus et lapidibus*.

Amplon. Quarto 293, 13th century, fols. 57-85, quatuor (vel potius quinque) libri mineralium domini Alberti Magni.

Magdalen 174, close of 13th century, fol. 51v- *de mineralibus libri tres* (?)

The Minerals is found in the following 14th century MSS, and doubtless in many others: Digby 119, 26; 183, 1; 190, 1; Ashmole 1471, fols. 1-48; Merton 285; S. Marco XIII, 18, fols. 1-31, "Explicit liber de lapidibus secundum fratrem Albertum qui liber oculo intitulatur"; CLM 16129, fols. 25-112; BN 7156, 2; BN 7475, 8.

[4] *Mineral.*, IV, i, 6, "Hi autem qui in cupro multum operantur in nostris partibus Parisiis videlicet at Coloniae et in aliis locis in quibus fui et vidi experiri."

Events of his life after 1250.

The two chief ecclesiastical offices held by Albert were those of provincial of his order in Germany from 1254 to 1257, and of bishop of Ratisbon, 1260-1262. He resigned from both positions, apparently preferring the scholar's life. Ptolemy of Lucca explains that German bishops had to use the sword too much for Albert's taste. In his work on animals Albert alludes in one passage to his villa on the Danube.[3] In 1256 he went to Rome to defend the friars against the attacks of William of St. Amour, and while in Italy discovered the *De motibus animalium* of Aristotle. In his theological *Summa* he speaks of having collected the material for his treatise *On the Unity of the Intellect against Averroes,* when he was "in the *curia* at the command of Lord Alexander the Pope."[4] In 1259, when the general chapter of the Dominicans met at Valenciennes, he was appointed upon a committee to draw up a course of study for the Order along with Aquinas and Pietro di Tarantasia, who in 1276 became Pope Innocent V. After resigning the bishopric of Ratisbon in 1262, Albert returned to teaching at Cologne, but in 1263 he preached the crusade in Germany and Bo-

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Ibid., II, ii, 11, "Narravit mihi unus ex nostris sociis curiosus experimentator quod vidit Fredericum Imperatorem habere magnetem qui non traxit ferrum sed ferrum vice versa traxit lapidem."

[1] *De animalibus,* XXIII, i, 40.

[2] Schools were established by the general chapter of the Dominicans in that year at Cologne, Oxford, Bologna, and Montpellier.

[3] *De animalibus,* VII, i, 6, "quod expertus sum in villa mea super Danubium"; cited by v. Hertling (1914), p. 16.

[4] *Summa,* XIII, 77, iv; cited by v. Hertling (1914), p. 14.

hemia, and his name appears in documents at Würzburg in that year and those immediately following.[1] In his *Politics* he speaks of having been papal *nuncius* in Saxony and Poland, where he found the barbaric custom still observed of killing the old men of the tribe when they had outlived their period of usefulness.[2] We are told that in 1270 he despatched a treatise to Paris to help Aquinas in connection with the affair of Siger de Brabant, and in 1277 visited that city again in person to defend his own Aristotelian teaching and the memory of Aquinas in connection with the condemnation by Stephen Tempier, bishop of Paris, and other doctors of 219 opinions ascribed to the same Siger de Brabant and others,[3]—an affair of which we shall have more to say later. The Catholic Encyclopedia and *Dictionnaire d'histoire et de géographie ecclésiastique* repeat the assertion of fifteenth century biographers that Albert attended the Council of Lyons in 1274, but the *Histoire Littéraire de la France* eighty years ago assured us that his name is not mentioned in the records of that assembly.[4]

Albert at Cologne.

This brief account of Albert's life has made it evident that he stayed in no one place for long at a time, and his own works show that he had traveled widely. He seems, however, to have returned repeatedly to Cologne, and to have passed more time there than at any other one place. There he saw ruined remains of Roman buildings excavated; [5] there he says that he wrote his *De natura locorum;* [6] and there other of his writings, partly in his own hand, were still treasured when Peter of Prussia wrote his life near the close of the fifteenth century.[1]

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[1] Sighart (1857), pp. 157, 159, 162.

[2] *Politics,* VII, 14; cited by v. Hertling (1914), p. 13.

[3] CE, "Albertus Magnus." I have not found original sources for these events and fear that they may be inferences from the *Speculum astronomiae.*

[4] HL XIX, 365; and v. Hertling (1914), p. 19. But he is called "Bishop of Lyons" in a 15th century MS at Munich; CLM 15181, fols. 167-77, Compendium magistri Magni Alberti episcopi Lugdunensis de disputatione corporis et animae.

[5] *De causis et proprietatibus elementorum,* I, ii, 3, "In Colonia vidimus altissimas fieri foveas et in fundo illarum inventa sunt paramenta (pavimenta?) mirabilis schematis et decoris quae constat ibi homines antiquitus fecisse et congestam fuisse terram super ea post ruinas aedificiorum"; quoted by v. Hertling (1914), p. 11.

[6] *De natura locorum,* III, 2; v. Hertling (1914), p. 11 note.

Contemporary estimates of Albert.

We have seen that Albert was already cited as an authority during his lifetime by such writers as Petrus Hispanus and Vincent of Beauvais. Roger Bacon in 1267 mentioned "Brother Albert of the Order of Friars Preachers" and William of Shyrwood as two of the foremost scholars of the time, although he seems rather jealous of Albert and inclined to rank William of Shyrwood and of course himself above him.[2] Such envy only proves the great reputation that Albert had. In the *Summa philosophiae* ascribed to Grosseteste but which we have seen was apparently written some years after his death, following a long list of ancient and Arabian philosophers and some comparatively modern Christian writers such as Gundissalinus, Constantinus, and Alfred of England, the author mentions as even "more modern" Alexander minor, presumably Alexander of Hales the Franciscan who died in 1245, and Albert of Cologne of the Order of Preachers. He regards them as distinguished philosophers but not to be held for authorities. However, he later prefers Albert's explanation of the virtues of gems to those of Democritus, Pythagoras, Plato, Hermes, and Avicenna. He also calls Albert "the most famous of modern theologians," and gives his arguments against vision being by extramission.[3] Ulrich Engelbert of Strasburg, a contemporary and pupil of Albert, in the fourth book of his *Summa theologiae* described "my lord Albert, once bishop of Ratisbon," as "a man in every science so divine that he may well be called the wonder and miracle of our time." [4]

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[1] Petrus de Prussia (1621), pp. 179-81. Recently H. Stadler has edited the *Historia animalium* from what is believed to be the autograph MS at Cologne in *Beiträge zur Gesch. d. Philos. d. Mittelalters*, vols. 15-16. See also his *Vorbemerkungen zur neuen Ausgabe der Tiergeschichte des Albertus Magnus* in *Sitzungsberichte d. kgl. bayr. Akad. d. Wiss. phil. hist. Classe*, Munich (1912), pp. 1-58. Stadler also edited from a Cologne MS, believed to be the archetype, *Liber de principiis motus processivi*, Munich, 1909.

[2] *Opus Tertium*, ed. Brewer (1859), p. 14.

[3] *Summa philosophiae*, I, 6; XIX, 6; XII, 17; Baur (1912), pp. 280, 633, 505.

[4] Cited by Petrus de Prussia (1621), p. 126.

Thomas of Cantimpré, in his moralizing *Bonum universale de apibus,* a farrago of monkish gossip and incredible tales, written apparently in 1276 or shortly after, emphasizes the saintly character of Albert who is apparently well along in years when Thomas writes.[1] He represents Albert as having told him that at Paris a demon appeared to him in the likeness of a certain friar in an attempt to keep him from his studies but departed at the sign of the cross.[2] Or again Thomas assures us that as Albert's auditor for a considerable time when he occupied the chair of theology he had seen for himself and "most certainly tested" how Albert for many years almost daily participated in the prayers by day and night and read the psalter of David and often sweated in religious contemplation and meditation. "What wonder," piously ejaculates Thomas, "that a man of such whole-hearted devotion and piety should show superhuman attainments in science!" [3]

II. *As a Scientist*

The scope of Albert's scientific treatises.

It may be well at the start to indicate the scope and character of Albert's works in the field of science. In general they follow the plan of the natural philosophy of Aristotle and parallel the titles of the works then attributed, in some cases incorrectly, to Aristotle. We have eight books of physics, psychological treatises such as the *De anima* and *De somno et vigilia,* both in three books, and works dealing with celestial phenomena, such as the *De meteoris* and *De coelo et mundo* in four books each, and with the universe and life in general, such as the *De causis et procreatione universi, De causis et proprietatibus elementorum et planetarum,* and the *De generatione et corruptione.* Geography is represented by the *De natura locorum,* zoology by the twenty-six books on animals, botany by the seven books on vegetables and plants, and mineralogy by the five books on minerals. Björnbo called attention to a work on mirrors or catoptric ascribed to "Albert the Preacher" in several manuscripts but which is not included in the editions of Albert's works and which has never been printed.[1] I do not know if this is the same treatise as a treatise on Perspective attributed to Albertus Magnus in a manuscript which Björnbo did not mention.[2] A work on the planting of trees and preserving of wine is sometimes ascribed to Albert in the manuscripts, but is probably rather by Petrus de Crescentiis or Galfridus de Vino Salvo.[3] I think that I have encountered only once in the manuscripts the attribution to Albert of an epitome of the *Almagest* of Ptolemy[4] and of a *Summa astrologiae.*[5] Fairly frequently one meets with some brief compendium of all natural philosophy ascribed to Albert, of which perhaps the most common is the *Philosophia pauperum* or "Introduction to the books of Aristotle on physics, sky and universe, generation and corruption, meteorology, and the soul."[1] These are either spurious, or, if based on Albert's writings, add nothing of importance to them. Finally we may note a group of works lying on the border of natural and occult science and which have been regarded as spurious: treatises on alchemy and chiromancy, the *Speculum astronomiae,* the *De secretis mulierum,* the *Liber aggregationis,* and the *De mirabilibus mundi.* Of some of these we shall treat in separate chapters.

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[1] "venerabilis ille frater ordinis predicatorum magister Albertus."

[2] *Bonum univ.,* II, 57, Partic. xxxv, "Simili prope modo magister Albertus theologus frater ordinis predicatorum narravit mihi quod Parisius illi demon in specie cuiusdam fratris apparuit ut eum a studio revocaret sed mox crucis virtute discessit."

[3] *Ibid.,* Partic. li, "Vidi et certissime expertus sum sicut auditor eius per multum tempus quam venerabilis ille frater ordinis predicatorum Albertus cuius superius fecimus mentionem multis annis fere quotidie cum tamen in cathedra theologie regeret tantum de die et nocte orationibus incumbebat ut psalterium davidicum legeret et interdum dictis horis et lectionibus et disputationibus terminatis contemplatione divine et meditationibus insudaret. Quid mirum ergo si talis homo super hominem in scientia profecerit qui tam sancte tam integre in virtute profecerit."

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[1] *Abhandl. z. Gesch. d. Math.* 26, 139 (1911).

[2] CLM 453, 15th century, fol. 87-.

[3] Corpus Christi 125, fol. 16r- "Incipit tractatus fratris Alberti de Colonia de plantacionibus arborum."

Ashmole 1471, late 14th century, fols. 137-43, "Incipit tractatus Alberti de plantationibus arborum et de conservatione vini . . . / . . . Explicit tractatus Alberti de plantationibus arborum et de conservatione vini. aliqui tamen asserunt Euclidem hunc librum fecisse."

Arundel 251, written on the back of the cover binding is "Albertus Magnus de Plantationibus arborum, etc." But in the Arundel catalogue of 1834 the work is listed as "Anonymi cuiusdam tractatus de plantationibus arborum, de conservatione fructuum et de vino," which has since been corrected to "Galfridi de Vino Salvo," etc.

BN 9328, 14th century, fol. 124- Petrus de Crecenciis, De plantationibus arborum.

[4] Vienna 5292, 15th century, fols. 1r-65v, Epitome in Almagestum Cl. Ptolomaei. Perhaps it is the same as CLM 56, 1434-1436 A. D., fols. 1-122, "Almagesti abbreviatum per mag. Thomam de Aquino," which opens, "Omnium recte philosophantium. . . ."

[5] Vienna 5309, 15th century, fols. 127r-55v, Summa astrologiae, "In hoc tractatu brevi . . . / . . . habencia probabilitatis."

Can a gradual intellectual development be traced in Albert's works?

The order in which Albert's numerous works were written is a matter difficult to determine but of some interest, although not of very great importance, for our investigation. The statement of Peter of Prussia that the translation of Aristotle "which we now use in the schools" was made by Thomas of Cantimpré at the suggestion of Aquinas, "for in Albert's time all commonly used the old translation,"[2] would, if true, suggest that Albert wrote his Aristotelian treatises early in life, since he actually outlived Aquinas. But not much reliance is to be placed in this statement of Peter, since it is reasonably certain that Thomas of Cantimpré at least did not translate Aristotle. I have been impressed by differing and almost inconsistent attitudes in different treatises by Albert, for instance in his attitude towards magic, which seem to hint that his opinions changed with the years, although it may be attributable, as in some other authors, to the fact that in different works he reflects the attitude of different authorities, or approaches different subjects with a different view-point, writing of theology as a theologian, but of Aristotle as a philosopher. However, Baeumker and Schneider, pursuing in connection with Albert's writings a different line of investigation from mine, have been struck with the same thing and have concluded that Albert underwent a gradual intellectual development. They note that in his *Commentaries on the Sentences* he is still glued to the Augustinian tradition, while in his *Summa* he is strongly influenced by Aristotle and working for a synthesis of Aristotle and Augustine. Finally, in his philosophical and scientific works, related to the genuine and spurious works of Aristotle, "he goes very far with this Arabian-trimmed Neo-Platonism, often so far that he finally feels compelled to explain such exposition as mere citation, and in the strife of conflicting masses of thought surging within him refers for his own personal interpretation to his theological writings." [1] From this it would seem that most of Albert's theological treatises were written before his scientific works, based upon Aristotle and spurious Arabic and other additions. But we have seen that many of his Aristotelian treatises were completed before the *Speculum naturale* of Vincent of Beauvais, whereas his *Sentences* name 1246 and 1249 as current dates.[2]

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[1] It is included in Borgnet's edition, vol. 5. Other such works are:

BN 16222, 14th century, fols. 22-67, Alberti compendium de negotio naturali; BN 16635, 14th century, fols. 1-53, Libri V Alberti Magni in philosophia naturali. Albertus Magnus, Summa naturalium, in Arundel 344, 13-14th century, fols. 40-65; Harleian 536, fols. 1-8; Harleian 4870, 14th century, #2.

[2] Petrus de Prussia (1621), p. 294.

His best works are those on natural science.

But while Albert may sometimes refer to his theological works for his own personal views, he does not do so in those passages which will especially concern us, and it is in his works on natural science that he seems to the modern reader more original. Indeed Jessen declared that repeated perusal of Albert's many writings in the field of natural history had convinced him that he was "original everywhere, even where he seems to copy." [3] Jessen, indeed, held that Albert would have been even more original and outspoken than he is, but for fear of the charge of heresy; but in my opinion there is little to support such a view. Be that as it may, in his works on natural science Albert does not merely repeat past ideas whether of Aristotle or others, but adds chapters of his own drawn in large measure from his own observation, experience, and classification. It is in his scientific works that he is as superior to Aquinas as the latter is generally considered to surpass him in the purely metaphysical and theological field. Since writing the foregoing sentences I have found that Peter of Prussia expressed much the same view in his life of Albert written toward the close of the fifteenth century. Peter says, "Moreover, this should be understood, that after Aristotle faith is to be put in Albert above all who have written in philosophy, because he has himself illuminated the writings of almost all philosophers and has seen wherein they spoke truly or falsely, nay more, since he himself was experienced above all others in natural phenomena. It may be that some, relying on their metaphysics or logic, can impugn him by certain arguments, but I think that no matter of great concern, since Albert himself says that faith is to be put in anyone who is expert in his art."[1]

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[1] Clemens Baeumker, *Die Stellung des Alfred von Sareshel* (Alfredus Anglicus) *und seiner Schrift De motu cordis in der Wissenschaft des beginnenden XIII Jahrhunderts,* (June 7, 1913), p. 12, in *Sitzungsberichte d. Königl. Bayer. Akad. d. Wiss., Philos-philol. u. hist. Klasse;* citing Arthur Schneider, *Die Psychologie Alberts des Grossen,* II, Münster, 1906, pp. 293-308, in *Beiträge z. Gesch. d. Philos. des Mittelalters,* IV, 5-6.

[2] Grabmann (1916), pp. 165-6, citing Pangerl (1912). Grabmann notes further that Albert did not leave his theological *Summa* unfinished, but that the part which has never been printed exists in a MS at Venice.

[3] C. Jessen (1867), p. 99.

Albert's fame in the early nineteenth century.

Albert's scientific fame perhaps reached its zenith shortly before the publication of Darwin's *Origin of Species* in 1859. In 1836 and 1837 Ernst Meyer published in *Linnaea*[2] his "Albertus Magnus, ein Beitrag zur Geschichte der Botanik im XIII Jahrhundert," and later in his *History of Botany*[3] ranked Albert as the greatest botanist during the long period between Aristotle and Theophrastus on the one hand and Andrea Cesalpini on the other. "Yes, more than that. From Aristotle, the creator of scientific botany, until his time this science sank deeper and deeper with time. With him it arose like the Phoenix from its ashes. That, I think, is praise enough, and this crown shall no one snatch away from him."[4] In the meantime, at Paris in 1853, Pouchet had published his *History of the Natural Sciences in the Middle Ages* with the sub-title, *Or Albertus Magnus and his age considered as the point of departure of the experimental school.*[5] But the extreme praise of Albert had occurred a little earlier in lectures on the history of science delivered by De Blainville at the Sorbonne in 1839-1841 and published a few years later.[1] De Blainville too centered his discussion of medieval science about Albert, to whom alone he devoted some ninety pages, extolling him for affirming the permanence of species and for "broadening" Aristotle to fit the requirements of theology. In ten theses in which De Blainville undertook to sum up briefly the chief legacies of Albert to science, he held that he completed and terminated the circle of human knowledge, adding to Aristotle the scientific demonstration of the relations of man with God; that he extended the scope of observation to every scientific field except anatomy; that he created the description of natural bodies, a thing unknown to the ancients; and that in filling in the gaps in Aristotle's writings he was the first to embrace all the natural sciences in a complete plan, logical and perfectly followed. "In accepting therefore with the Christian Aristotle," concluded De Blainville, "the first verse of *Genesis,* 'In the beginning God created heaven and earth,' and the consequences which follow it, we have, in my opinion, reached the *apogée* of the encyclopedia of human knowledge, which can now only extend itself in respect to the number and the deeper knowledge of material objects."

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[1] Petrus de Prussia (1621), p. 288.

[2] Halle, X, 641-741; XI, 545.

[3] *Geschichte der Botanik,* Königsberg, 1855, IV, 39.

[4] Meyer (1855), p. 40.

[5] Pouchet's fifth chapter (p. 203-644) was devoted to *École*

A survival of the medieval attitude.

This passage from De Blainville, who seems to have been a Roman Catholic, is very interesting as showing how the progress of modern science in his own time and the centuries just preceding could be almost completely miscomprehended by a professed historian of science. We must not, however, suppose that such misconceptions of the progress of science were universal or even general in the first half of the nineteenth century. The article on Albertus Magnus in the *Histoire Littéraire de la France,* which was published in 1838, recognizes that Albert did not extend the

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Expérimentale, and of this pp. 203-320 to Albert himself.

[1] M. H. De Blainville, *Histoire des sciences de l'organisation . . . Rédigée d'après ses notes et ses leçons faites à la Sorbonne de 1839 à 1841, avec les développements nécessaires et plusieurs additions, par F. L. M. Maupied,* in 3 vols, Paris, 1847.

bounds of the sciences as much as had been supposed, and that progress had been made since the sixteenth century which rendered that part of his works "almost useless." [1] The passage from De Blainville is interesting also as showing the same intimate connection presupposed between Christian theology, natural science, and Aristotelianism as in the days of the great Dominicans themselves. Again, it reveals the extent to which natural science, since the appearance of *The Origin of Species,* has tended to the opposite extreme.

Recent historians of science and Albert.

As for historians of science, they have been rather scarcer of late than in the earlier years of the nineteenth century, when the subject seems to have had a great vogue in France. Or at least the historians of science have been less sympathetic with the distant past. Perhaps the inclination has been to go almost as far toward the other pole of neglect as De Blainville went toward that of extollation. But the modern eulogies of the scientific attainments of Roger Bacon, supposed to be a thorn in the side of the medieval church and falsely regarded as its victim, and as the one lone scientific spirit of the middle ages, have been rather more absurd than the earlier praises of Albert, who was represented both as a strong pillar in the church and the backbone of medieval and Christian science. Indeed, the *Histoire Littéraire,* in the same passage which we a moment ago quoted against De Blainville, also states with probable justification that Albert did "more than any other doctor of his day" to introduce the natural sciences into the course of public and private studies, and that it was his taste for those subjects which won him his popular renown and the homage of scholars until the end of the seventeenth century. At no period, however, has Albert been entirely without defenders. Jessen in 1867 regarded him as an original natural scientist. Stadler in 1906 recognized that "he made many independent observations, perhaps even carried out experiments," and showed great interest in biology.[2]

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[1] HL XIX, 377.

[2] Stadler (1906), p. 2.

Albert's scientific spirit.

Coming back from the opinions of others concerning Albert to his own attitude towards natural science, it is to be noted that, while he may make all sorts of mistakes judged by modern standards, he does show unmistakable signs of the scientific spirit. This will become more apparent as we proceed, but for the present we may cite two examples of it, and these from a work based upon a pseudo-Aristotelian treatise and one which at first sight might seem quite superstitious and unscientific to the modern reader, since it is full of astrology, the *De causis et proprietatibus elementorum et planetarum*.[1] In the first passage Albert repeats the justification of natural science against a narrow religious attitude which we heard from the lips of William of Conches in the previous century. When Albert finds that some men attribute the deluge simply to the divine will and believe that no other cause for it should be sought, he replies that he too ascribes it ultimately to the divine will, but that he believes that God acts through natural causes in the case of natural phenomena, and that, while he would not presume to search the causes of the divine will, he does feel free to investigate those natural causes which were the divine instruments. A little further on in the same chapter Albert declares that "it is not enough to know in terms of universals, but we seek to know each object's own peculiar characteristics, for this is the best and perfect kind of science." [2]

Philosophical generalization and scientific detai

This desire for concrete, specific, detailed, accurate knowledge concerning everything in nature is felt by Albert in other of his writings to be scarcely in the spirit of the Aristotelian natural philosophy which he follows and sets forth in his parallel treatises. In his work on animals a cleavage may be observed between those parts where Albert discusses the general natures and common characteristics of animals and seems to follow Aristotle rather closely, and those books where he lists and describes particular animals with numerous allusions to recent experience and considerable criticism of past authorities. At the beginning of his twenty-second book he apologizes for listing particular animals in alphabetical order, which is "not appropriate to philosophy," by saying that "we know we are debtors both to the wise and to the unlearned, and those things which are told in particular terms better instruct a rustic intelligence." But while this desire to describe particular objects precisely is felt by Albert to be not in accord with traditional philosophic methods of presentation, it is a desire which many of his contemporaries share with him. At the beginning of his sixth book on vegetables and plants, where particular herbs and trees are listed, he explains, "In this sixth book of vegetables we satisfy the curiosity of our students rather than philosophy, for philosophy cannot deal with particulars."

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[1] I, ii, 9.

[2] "Non autem sufficit scire in universali sed quaerimus scire unumquodque secundum quod in propria natura se habet, hoc enim optimum et perfectum est genus sciendi." Galen had expressed much the same thought eleven centuries before.

Medieval interest in nature.

This healthy interest in nature and commendable curiosity concerning real things was not confined to Albert's students nor to "rustic intelligences." One has only to examine the sculpture of the great thirteenth century cathedrals to see that the craftsmen of the towns were close observers of the world of nature and that every artist was a naturalist too. In the foliage that twines about the capitals of the columns in French Gothic cathedrals it is easy to recognize, says M. Mâle, a large number of plants: "the plantain, arum, ranunculus, fern, clover, coladine, hepatica, columbine, cress, parsley, strawberry-plant, ivy, snapdragon, the flower of the broom and the leaf of the oak, a typically French collection of flowers loved from childhood."[1] *Mutatis mutandis,* the same statement could be made concerning the carved vegetation that runs riot in Lincoln cathedral. "The thirteenth century sculptors sang their *chant de mai.* All the spring delights of the Middle

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[1] Émile Mâle, *Religious Art in France in the Thirteenth Century,* translated from the third edition by Dora Nussey, 1913, p. 52.

Ages live again in their work—the exhilaration of Palm Sunday, the garlands of flowers, the bouquets fastened on the doors, the strewing of fresh herbs in the chapels, the magical flowers of the feast of Saint John—all the fleeting charm of those old-time springs and summers. The Middle Ages, so often said to have little love for nature, in point of fact gazed at every blade of grass with reverence."[1] But it is not merely love of nature but scientific interest and accuracy that we see revealed in the sculptures of the cathedrals and in the note-book of the thirteenth century architect, Villard de Honnecourt,[2] with its sketches of insect as well as animal life, of a lobster, two parroquets on a perch, the spirals of a snail's shell, a fly, a dragonfly, and a grasshopper, as well as a bear and a lion from life, and more familiar animals such as the cat and swan. The sculptors of gargoyles and chimeras were not content to reproduce existing animals but showed their command of animal anatomy by creating strange compound and hybrid monsters —one might almost say, evolving new species—which nevertheless have all the verisimilitude of copies from living forms. It was these breeders in stone, these Burbanks of the pencil, these Darwins with the chisel, who knew nature and had studied botany and zoology in a way superior to the scholar who simply pored over the works of Aristotle and Pliny. No wonder that Albert's students were curious about particular things.

Albert's own attitude.

But one is inclined to wonder whether the passage from the *De causis et proprietatibus elementorum et planetarum*, which we quoted first, may not have been written after the passages which we have quoted from his works on plants and animals, and whether Albert had come, thanks possibly to that same stimulating scientific curiosity of his students, to cease to apologize for the detailed description of particular objects as unphilosophical and to praise it as "the best and perfect kind of science." At any rate it is those portions of his works on animals, plants, and minerals which he devotes to such description of particular objects which possess most independent value, and it is perhaps also worth noting that Ptolemy of Lucca in looking back upon Albert's work seems not only to distinguish his writings on logic and theology from those on nature, but also to imply a distinction between Aristotle's natural philosophy and his "very well-known and most excellent contribution to the experimental knowledge of things of nature." [1] Ptolemy seems to say Aristotle's contribution, but the credit really belongs largely to Albert and his students.

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[1] *Ibid.*, 53.

[2] Published in facsimile at London, 1859, and Paris, 1908.

Albert and modern experimentation.

Pouchet was therefore not without justification in his sub-title, "Or Albertus Magnus and his Period Considered as the Beginning of the Experimental School." His distinguishing, however, three stages of scientific progress in the history of civilization—the first, Greek, characterized by observation, and represented especially by Aristotle; the second, Roman, marked by erudition and typified by Pliny; the third, medieval, distinguished by experimentation, and having Albertus Magnus and Roger Bacon as its two great representatives;—was rather too general and sweeping. Galen, for instance, was a great experimenter and the ancient Empirics put little trust in anything except experience. Albert himself, in discussing "the serious problem" whether life is possible in the Antipodes or southern hemisphere, states that "the most powerful kings and the most accomplished philosophers have labored over it from antiquity, the kings forsooth by experiment and the philosophers by rational inquiry." [2] Moreover, neither Roger Bacon nor Albert can be shown to have done much experimenting of the sort, carefully planned and regulated, which is carried on in modern laboratories. Meyer in his *History of Botany*,[3] although Albert was a great favorite with him, felt con-strained to renounce the credit for purposive experimentation which Pouchet had given him. "How gladly would I see this crown also placed deservedly upon my favorite's head! . . . But I do not know of his undertaking an experiment in order to solve a physiological or physical problem in which he had a clearly defined purpose and the suitable materials at hand for carrying it out; his books on plants certainly do not contain a single one."

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[1] *Hist. Eccles.*, XXII, 18. "Hic commentatus est totam logicam Aristotelis, philosophiam naturalem et quantum ad naturalem experientiam naturarum clarissima et excellentissima tradidit. Hic theologiam declaravit." I assume that Aristotle is understood as the subject of *tradidit*.

[2] *De natura locorum*, I, 7.

[3] IV, 40.

Personal observation and experience of plants.

Albert's work on plants does contain, however, many passages in which he recognizes experience as a criterion of truth or gives the results of his personal observations. Such passages occur especially in the sixth book where he tries to satisfy his students' curiosity, but we may first note an earlier passage where he recommends "making conjectures and experiments" in order to learn the nature of trees in general and of each variety of tree, herb, fruit, and fungus in particular. Since, however, one can scarcely have personal experience of them all, it is also advisable to read the books which the experts (*experti*) of antiquity have written on such matters.[1] But a mistrust of the assertions of others often accompanies Albert's reliance upon personal observation and experience. Like Galen in his work on medicinal simples, he explains in opening his sixth book that merely to list the names of plants found in existing books would fill a volume, and that he will limit his discussion to those native varieties "better known among us." Of some of these he has had personal experience; for the others he follows authors whom he has found unready to state anything unless it was proved by experience. For experience alone is reliable concerning particular natures. He cautions in regard to a tree which is said to save doves from serpents, "But this has not been sufficiently proved by certain experience, like the other facts which are written here, but is found in the writings of the ancients." [2] Of another assertion he remarks, "But this is proved by no experience"; [3] and of a third he says, "As some affirm, but I have not tested this myself."[1]

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[1] *De veget. et plantis,* I, ii, 12.

[2] VI, i, 30.

[3] VI, i, 2.

Experience a criterion in zoology.

Personal observation and experience are equally, if not more, noticeable in Albert's work on animals. He proposes to tell "what he knows by reason and what he sees by experience of the natures of animals"; he adds that science cannot be attained in all matters by demonstration, in some cases one must resort to conjecture.[2] After listing various remedies for the infirmities of falcons from the work on falconry of the Emperor Frederick, he concludes, "Such are the medicines which one finds given for falcons and the experience of wise men, but the wise falconer will with time add to or subtract from them according to his own experience of what is beneficial to the state of health of the birds. For experience is the best teacher in all matters of this sort."[3]

Observations of Albert and his associates.

In the treatise on animals as in that on plants Albert's allusions to experience occur mainly in the last few books where he describes particular animals. Here he often says, "I have tested this," or "I and my associates have experienced,"[4] or "I have not experienced this," or "I have proved that this is not true."[5] Like Alexander of Neckam he rejects the story that the beaver castrates itself in order to escape with its life from its hunters; Albert says that experience near his home has often disproved this.[6] In discussing whales he restricts himself entirely to the results of his own observation, saying, "We pass over what the Ancients have written on this topic because their statements do not agree with experience."[7] According to Pouchet[8] Albert gives even more detailed information concerning whales than do the Norse sagas, and also includes animals of the north unknown to classical writers. He occasionally reveals his nationality by giving the German as well as the

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[1] *De veget. et plantis,* VI, i, 35.

[2] *De animalibus,* XI, i, 1.

[3] XXIII, i, 40 (xix).

[4] XXII, ii, 10 and 99; XXIII, i, 5 and 34-35 and 83 and 123; XXVI, i, 10 and 14 and 20.

[5] XXIII, i, 9 and 14 and 23 and 57 and 83 and 104.

[6] XXII, ii, 1.

[7] XXIV, i, 28.

[8] Pouchet (1853), pp. 285-6.

Latin names of animals, and he displays an acquaintance with the fauna of surrounding countries such as Norway, Sweden, Bohemia, and Carinthia.[1] He asserts that there are no eels in the Danube and its tributaries, but that they abound in the other rivers of Germany.[2] He tells of observing the habits of eagles in Livonia,[3] or supports the account in Solinus of a monstrous beast with fore legs like human arms and hind legs like human legs by stating that he has seen both male and female of the species captured in the forests of Russia (*Sclaviae*).[4] Of his wide travels and observation of natural phenomena we shall meet other examples as we proceed.

Experiments with animals.

Albert has not only observed animal life widely, he has also performed experiments with animals as he apparently did not do with plants. He and his associates, for instance, have proved by experiment that a cicada goes on singing in its breast for a long time after its head has been cut off.[5] He also proved to his satisfaction that the turtle, although a marine animal, would not drink sea water, unless possibly fresh water which flowed into the sea, by experimenting with a turtle in a vessel of water.[6] He has heard it said that the ostrich eats and digests iron, but the many ostriches to whom he has offered the metal have consistently declined it, although they would devour with avidity stones and bones cut into small bits.[7] Crude experiments these may be, but they are at least purposive.

Past authors questioned.

Albert also often expresses doubt as to certain statements concerning animals on the ground that they have not been tested by experience, even if he has [illegible] no opportunity to disprove them. And he draws the hair f[illegible] distinction between authors who state what that themselves have seen and tested and those who appear simply to repeat rumor or folk-lore. That there are any such birds as gryphons or griffins, he believes is affirmed in story-books (*historiae*) rather than supported by the experiments of philosophers or arguments of philosophy.[1] The story found in the *Physiologus* of the pelican's restoring its young with its own blood he also considers as "read in story-books rather than proved philosophically by experience," [2]—a criticism which shows how mistaken those modern scholars have been who have declared the Physiologus and Bestiaries representative of the thirteenth century attitude towards nature. The accounts of harpies which one reads are also according to Albert "not based upon experience, but are the assertions of men of no great authority." [3] They are said to be rapacious birds with crooked nails and human faces, and when a harpy meets a man in the desert it is said to kill him, but afterwards, when it sees by its reflection in the water that its own face is human, it grieves all the rest of its life for the man whom it has slain. "But these statements," says Albert, "have not been experienced and seem fabulous. Such tales are told especially by a certain Adelinus" (perhaps the Anglo-Saxon Aldhelm) "and Solinus and Jorach." Albert is particularly chary of accepting the assertions of these last two authors, assuring us, anent their statement that certain birds can fly unharmed through flames, "These philosophers tell many lies and I think that this is one of their lies." [4] In yet other passages Albert calls one or the other of them a liar.[5] He also sometimes rejects statements of Pliny, once classing him with Solinus among those who rehearse popular hearsay rather than disclose scientific experience.[6]

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[1] XXII, ii, 29 and 39 and 41 and 51 and 97.

[2] XXIV, i, 9.

[3] XXIII, i, 9.

[4] XXII, ii, 28.

[5] XXVI, i, 10.

[6] XXIV, i, 123.

[7] XXIII, i, 104.

Instances of credulity.

Albert thus [illegible] days considerable independence in dealing with past [illegible] more [illegible] Yet at times statements in earlier writers which seem absurd to us pass him unchallenged. He is far, for example, from rejecting all of Pliny's marvelous assertions. He still believes that the little fish *eschinus* can stop "a ship two hundred feet or more" in length by clinging to its keel, so that neither wind nor art nor violence can move it.[1] And he adds something to Pliny's tale of hunters who make good their escape to their ship with the tiger's cubs by throwing them one at a time to the pursuing tigress, who takes each whelp back to her lair before returning to the pursuit of the hunters.[2] Albert's emendation is that the hunters provide themselves with glass spheres which they roll one at a time towards the pursuing tigress.[3] Seeing her own reflection on a small scale in the glass ball, she thinks it one of her cubs until she has vainly tried to give it milk, when she discovers the fraud and bounds after the hunters again. But a second and a third glass ball deceive her temporarily as before, and so the hunters reach their ship without having had to surrender any of the real cubs. This imputation of singular stupidity to the tigress should be kept in mind to set against other passages in medieval writers where almost human sagacity is ascribed to animals. Although in two or three preceding passages Albert has refuted the doctrine of spontaneous generation of animal life,[4] he attributes the following passage to Pliny without adverse criticism.[5] "There is a worm shaped like a star, as Pliny says, which shines like a star at night; but it never appears except when after great clouds it predicts clear weather.[6] He says that there is so much rigid cold in this worm that it extinguishes fire like ice. And if a man's flesh is touched with its slime, all the hair falls off and what it touches decays. And he says that they beget nothing, nor is there male or female among them. Therefore they are generated from decaying matter." Albert also accepts the story of the poisoned maiden sent to Alexander the Great.

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[1] XXIII, i, 54.

[2] XXIII, i, 93.

[3] XXIII, i, 55.

[4] XXIII, i, 22.

[5] XXII, ii, 56. Sed iste Jorach frequenter mentitur. XXV, i, 5. Et sicut in multis mentitur Solinus, ita et in hoc falsum dicit.

[6] XXV, i, 26. Hoc est verius quod de draconibus ab expertis Philosophorum invenitur. Si autem sequamur dicta eorum qui potius referunt audita vulgi quam physica dictorum suorum ostendant experta, tunc sequendo Plinium et Solinum et quosdam alios dicemus. . . . For further criticism of Pliny see XXV, i, 13, and XXIII, i, 9.

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[1] XXIV, i, 47. Pliny, NH XXXII, i, spells it *echenais* or *echeneis*, as does Plutarch. We have seen other medieval authors spell it *echinus*.

[2] NH, VIII, 25.

[3] XXII, ii, 101.

[4] XVII, ii, 1; XXIII, i, 14; see also *Meteor.*, IV, i, 11.

[5] I have been unable, however, to run it down in the *Natural History;* perhaps it is in the *Medicina* of the Pseudo-Pliny.

[6] XXVI, i, 37.

Incredible "experiences."

Albert also is unduly credulous of utterances about animals supposed to be based upon experience, although he cannot be called a mere empiricist, since he tries to test particular statements by the general laws concerning living beings which he has read in Aristotle or derived from his own experience and reflection. He denies, for example, Pliny's statement that other animals are attracted by the pleasant smell which the panther emits as it sleeps after overeating, on the ground that man is the only animal who is pleased or displeased by odors.[1] But it would seem that some of the fishermen, fowlers, and hunters from whom he gleaned bits of zoological information were not so trustworthy as he imagined. He says that "a trustworthy person" told him that he saw in an eagle's nest three hundred ducks, over a hundred geese, about forty hares, and many large fish, all of which were required to satisfy the appetites of the young eagles.[2] He also "heard from trustworthy persons" that a serpent with the virgin countenance of a beardless man "was slain in an island of Germany and there displayed in our times to all who wished to see it until the flesh putrefied." [3] Such reports of mermaids and sea-serpents have still, however, a certain currency. Experienced hunters said that worms could be killed in any beast by suspending from its neck a strip of citron (*sticados citrinum*) immediately after it had been dried.[4] German artificers of Albert's day told him that the hyena bore a gem in its eyes, or more truly in its forehead.[5] Albert sometimes has a tall story of his own to tell. At Cologne in the presence of himself and many associates a little girl of perhaps three years was exhibited who, as soon as she was released from her mother's hands, ran to the corners of the room searching for spiders, "and ate them all large and small, and flourished on this diet and greatly preferred it to all other food."[1] Albert also learned by personal experience that moles gladly eat frogs and toads. For once he saw a mole who held by the foot a big toad which "cried loudly because of the mole's bite."[2] He also found by experience that both frogs and toads would eat a dead mole. In affirming that the custom of killing off the old men is still prevalent within the borders of Saxony and Poland, Albert says, "As I have seen with my own eyes"; but really all that he has seen is the graves of their fathers which the sons have shown to him.[3]

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[1] XXII, ii, 88.

[2] XXIII, i, 9.

[3] XXV, i, 28.

[4] XXII, ii, 19.

[5] XXII, ii, 56.

Minerals and experience.

Albert's general attitude towards past authorities and present experience remains the same in his treatise on minerals. He will give the names of the important gems and state their virtues as known from authorities and experience, but he will not repeat everything that has been said about precious stones because it is not profitable for science. "For natural science is not simply receiving what one is told, but the investigation of causes in natural phenomena."[4] Concerning metals, too, he intends to state "rationally either what has been handed down by the philosophers or what I myself have experienced."[5] He adds that once he wandered far in exile to places rich in mines in order that he might test the natures of metals. "And for this same reason I investigated the transmutation of metals among the alchemists, in order that I might observe something of the nature and characteristics of the metals." In a later chapter he alludes to workers in copper "in our parts, namely, Paris and Cologne, and in other places where I have been and seen things tested by experience."[6] *Fui et vidi experiri,* such is Albert the Great's peaceful paraphrase, probably unintentional, for warring Caesar's *Veni, vidi, vici.*

Minerals and credulity.

Again, also, in the treatise on minerals, reliance upon experience proves to be no sure guarantee against incorrect notions, credulity, and unquestioning trust in authority.

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[1] VII, ii, 5.

[2] XXII, ii, 99.

[3] *Polit.,* VII, 14.

[4] *Mineralium,* II, ii, 1.

[5] III, i, 1.

[6] IV, i, 6.

Albert still repeats[1] the old notion that "adamant," hard as it is, is softened and dissolved by the blood and flesh of a goat, especially if the goat for some time before has been fed on a diet of certain herbs and wine.[2] He adds that this property of goat's blood makes it beneficial for sufferers from stone in the bladder. Albert repeats with a qualifying "It is said" the statement that the emerald comes from the nests of gryphons or griffins,[3] but he does not stop to deny the existence of those birds, as we have heard him do elsewhere. He adds, however, as to the source of the emerald that "a truthful and curious experimenter coming from Greece" had said that it was produced in rocks under the sea. This expression, "curious experimenter" (*curiosus experimentator*), or perhaps better "inquisitive observer," Albert also applied to one of his associates who saw Frederick II's peculiar magnet.[4] In the present discussion of the emerald he adds that experience in his own time has proved that this stone, "if good and true," cannot endure sexual intercourse, so that the reigning king of Hungary, who was wearing an emerald upon his finger when he went in to his wife, broke it into three pieces. "And that is probably why they say that this stone inclines its wearer to chastity."

Tale of a toad and an emerald.

Albert, however, had told as a personal experience a stranger tale than this of an emerald in his work on vegetables and plants in order to illustrate "the many effects of stones and plants which are known by experience and by which wonders are worked." But as a matter of fact, the incident is concerned not with an emerald and a plant, but an emerald and a toad, an animal which one would infer was in Albert's day often the subject of experiment.

"An emerald was recently seen among us, small in size but marvelous in beauty. When its virtue was to be tested, someone stepped forth and said that, if a circle was made about a toad with the emerald and then the stone was set before the toad's eyes, one of two things would happen. Either the stone, if of weak virtue, would be broken by the gaze of the toad; or the toad would burst, if the stone was possessed of full natural vigor. Without delay things were arranged as he bade; and after a short lapse of time, during which the toad kept its eye unswervingly upon the gem, the latter began to crack like a nut and a portion of it flew from the ring. Then the toad, which had stood immovable hitherto, withdrew as if it had been freed from the influence of the gem." [1]

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[1] II, ii, 1.

[2] Pliny, NH XXXVII, 15, agrees with the passage in Albert only in the general notion that goat's blood will break adamant.

[3] II, ii, 17.

[4] II, ii, 11.

Experience versus Aristotle.

In the incident just narrated Albert was perhaps tricked by some traveling magician. But let us conclude our discussion of his general scientific method by some more rational instances of personal observation and experience. In his treatise on meteorology his discussion of the rainbow, which occupies some twenty-four pages of Borgnet's text,[2] is especially based upon experience and full of allusions to it—a very interesting fact in view of the large space which the discussion of the rainbow occupies in Roger Bacon's better known eulogy of experimental science. Albert recounts his own observations when sailing over great waves or when looking down from the top of a castle built upon a high mountain, "and the time when this was seen was in the morning after a rainy night, and it was in the autumn with the sun in the sign of Virgo." Albert takes exception to Aristotle's assertion that rainbows caused by the moon at night appear only twice in fifty years. He and many others have seen a bow at night, and "truthful experimenters have found by experience" (*veridici experimentatores experti sunt*) that a rainbow has appeared twice at night in the same year. Nor can Albert conceive of any astronomical reason why it should appear only twice in fifty years. "And so I think that Aristotle stated this from the opinions of others and not from the truth of demonstration or experience, while those facts which have been adduced against his statement have been experienced beyond a doubt by myself and by other reliable investigators associated with me." The very chapter headings of this portion of Albert's treatise suggest an antithesis between the ancient authorities and recent experimental investigation, for instance: "Of the Iris of the Moon and what Ancients have said of it and what Moderns have tested by experience,"[1] and "A Digression stating Seneca's views concerning *virgae* and experiments with certain arcs seen in modern times."[2] Thus while Albert of course believes that the statements of many of his authorities are based upon experience, he seems to feel that he and his associates have founded an important modern school for the investigation of nature at first hand. We may choose to regard it as a mere school of observation, but he dignifies its members by the title of *experimentatores*. Again therefore we may admit that Pouchet was not unjustified in associating Albert with the modern experimental school.

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[1] *De veget. et plantis,* VI, ii, 1. "Smaragdus enim nuper apud nos visus est parvus quidem quantitate et mirabiliter pulcher, cuius cum virtus probari deberet, adstitit qui diceret, quod si circa bufonem circulus smaragdo fieret et postea lapis oculis bufonis exhiberetur, alterum duorum, quod aut lapis frangeretur ad visum bufonis si debilem haberet lapis virtutem; aut bufo rumperetur si lapis esset in naturali suo vigore: nec mora factum est ut dixit et ad modicum temporis intervallum, dum bufo adspiceret lapidem nec visum averteret ab ipso, crepitare coepit lapis sicut avellana rumperetur et exilivit ex annulo una pars eiusdem, et tunc bufo qui ante stetit immobilis, coepit recedere ac si absolutus esset a lapidis virtute."

[2] *Meteor.,* III, iv, 8-26 (Borgnet, vol. IV, 674-97).

III. *His Allusions to Magic*

At the close of his story of the toad and the emerald Albert adds that there are many other such virtues of stones and plants which are learned by experience, and that magicians investigate the same and work wonders by them. It is therefore quite appropriate for us to turn directly from his attitude to experimental method to his conception of magic. Like William of Auvergne he hints at an association between the two. His pupil and contemporary, Ulrich

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[1] III, iv, 11.

[2] III, iv, 28.

Engelbert of Strasburg, actually called him "expert in magic." [1]

Peter of Prussia on Albert's occult science.

In his *Life of Albert* Peter of Prussia not only is evidently concerned to make him out a saint as well as a scientist, telling of his devotion to the Eucharist [2] and the Virgin Mary and the wood of the Holy Cross [3] and of the miraculous visions which he had from childhood, in which the Virgin and the Apostle Paul appeared to him,[4] and how he advanced more in knowledge by prayer than by study and labor,[5] and that he read the Psalter through daily.[6] He also devotes a number of chapters [7] to a defense of Albert against the charge of having indulged in occult sciences, and of having been "too curious concerning natural phenomena." [8] Peter explains that many superstitions were rife in Albert's time and that nigromancers were fascinating the people by their false miracles, and pretending that their sorcery was worked by the sciences of astronomy, mathematics, and alchemy.[9] It was therefore essential that some man who was equally learned and devout should thoroughly examine these sciences, proving what was good in them and rejecting what was bad.[10] Peter is inclined to be disingenuous in stating Albert's attitude toward some of the occult sciences, especially the engraving of stones with images according to the aspects of the stars, which he misrepresents Albert as prohibiting, whereas Albert really calls it a good doctrine, as we shall show later. Peter however states "how useful it is to know natural and occult phenomena in the nature of things, and that those who write about such things are to be praised for it." [11] Also "that it is useful and necessary to know the facts of nature even if they are indecent." [12] Later on, towards the close of his book, Peter denies various feats of magic that by his time had come to be popularly recounted of Albert, and then does his best to make up for the subtracted marvels by himself inventing many pious miracles in which he would have us believe Albert was concerned.[1]

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[1] Peter of Prussia (1621), 126.

[2] Cap. 20.

[3] Caps. 21-24.

[4] Caps. 1, 25, 29.

[5] Cap. 3.

[6] Cap. 19.

[7] Caps. 8-18.

[8] P. 106.

[9] P. 107.

[10] P. 108.

[11] Cap. 17, p. 161.

[12] Cap. 18, p. 165.

Trithemius on Albert's study of magic.

The learned Trithemius (1462-1516), abbot of Sponheim, in a letter to John Westenburgh in which he defends himself against the charge of magic, admits that he "cannot say that he is entirely ignorant of natural magic," a form of wisdom which he regards very highly; and adduces in his justification the example of "Albertus Magnus, that most learned man and among the saints truly most saintly, of the profoundest intellect, worthy of eternal memory, who scrutinized the depths of natural philosophy, and learned to know marvels unheard of by others." [2] Even to this day, continues Trithemius, he is unjustly regarded by the unlearned as a magician and devotee of superstition. For he was not ignorant of the magic of nature, and he had innocently read and mastered a great number of superstitious books by depraved men. For not the knowledge but the practice of evil is evil. Trithemius admits that he himself has read many books of superstitious and even diabolical magic, but contends that this is necessary, if one is to learn to distinguish natural from illicit magic.

Magnus in magia.

The brief but sane estimate of Albertus Magnus published eighty years ago in the *Histoire Littéraire de la France*, from which we have already had occasion to quote regarding his importance in the history of natural science, mentions the efforts of Trithemius and Naudé to defend him from the charge of magic, but adds that even his panegyrists have called him "great in magic, greater in philosophy, greatest in theology," and agrees that he frequently shows a leaning towards the occult sciences. "He is an alchemist, he is an astrologer, he believes in enchantments; he delights like most savants of his age in explaining all phenomena that surprise him by supernatural causes." This rough characterization contains much truth, although it is hardly true that Albert gave supernatural explanations for strange natural phenomena. Rather he believed in occult forces and marvels in nature which we no longer credit. We also have already stated it as our opinion that he was really much greater as a natural scientist than as a theologian. But we have now to examine what grounds there are for calling him *magnus in magia,* and *in magicis expertus.*

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[1] Cap. 44, *et seq.*, pp. 299-341.

[2] Quoted in Latin by Wolfgang E. Heidel in his *Vita Trithemii*, prefixed to his edition of the *Steganographia*, cap. xvii, "Trithemium non fuisse alchymistam, astrologum et magum, ostenditur."

His varying treatment of magic.

Magic is often mentioned by Albert, both in his Biblical and Aristotelian commentaries, both in his theological writings and his works on natural science. Some references to magic arts, occurring chiefly in the Biblical commentaries, are too brief, incidental, and perfunctory to afford any particular information.[1] The other passages seem scarcely consistent with one another and will require separate treatment. We shall first consider those in which Albert more or less adheres to the traditional Christian attitude of condemnation of magic as criminal and dealing with demons, of recognition of its marvels but jealous differentiation of them from divine miracle. It should be observed that all such passages occur in his theological writings and that in them he does little more than rehearse opinions which we have already encountered in the writings of the early Christian fathers with a few additional citations from books of necromancy or from Arabic works on natural science such as those of Algazel and Avicenna.

Reality of magic.

Albert has no doubt either in his scientific or religious writings that marvels can be worked by magic. It is true that one of its departments, *praestigia,* has to do with illusions and juggleries in which things are made to appear to exist which have no reality. But it also performs actual transformations.[2] But even the actual performances of magic are deceptive in that demons by their means lead human souls astray, which is far worse than merely to deceive the eye.[3]

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[1] For instance, *Commentary on Micah,* VI, 11, "*Maleficia* are *veneficia* by which men are deceived in the works of necromancers and of idols."

[2] *Sententiae,* II, 7, F, vi.

[3] *Summa,* II, 30.

Magic due to demons.

Albert affirms in his theological *Summa* that it is the consensus of opinion that magic is due to demons. "For the saints expressly say so, and it is the common opinion of all persons, and it is taught in that part of necromancy which deals with images and rings and mirrors of Venus and seals of demons by Achot Graecus and Grema of Babylon and Hermes of Egypt, and invocations for this purpose are described in the book of Hermogenes and Philetus, the necromancers, and in the book called the Almandel of Solomon." [1] In his *Commentary on the Sentences* [2] Albert declares that to make use of "magic virtues" is evil and apostasy from the Faith, whether one openly resorts to "invocations, conjurations, sacrifices, suffumigations, and adorations," or to some simple operation which none the less requires demon aid for its performance. One must beware even of "mathematical virtues," that is, of astrological forces, especially in "images, rings, mirrors, and characters," lest the practice of idolatry be introduced. In commenting upon the passage in the gospel where the Pharisees accuse Christ of casting out demons through the prince of demons, Albert admits that necromancers are able to cast out demons and to restrain them from doing external damage, but holds that they cannot like Christ restrain the evil spirits from inciting inward sin.[3]

Magic and miracle.

Albert will not admit, however, that the marvels of magic compare with divine miracles. For one thing, feats of magic do not even happen as instantaneously as miracles, although they occur much more rapidly than the ordinary processes of nature. But except for this difference in speed the works of magic can usually be explained as the product of natural forces, and by the fact that the demons are aided in their operations by the influence of the stars. To change rods into snakes, for instance, as Pharaoh's magicians did, is simply hastening the process by which worms generate in decaying trees. Indeed, Albert is inclined to believe that the demons "produce no permanent substantial form that would not easily be produced by putrefaction."[1] The magic power of fascination is after all only analogous to the virtue of the sapphire in curing ulcers or of the emerald in restraining sexual passion. Albert adds the comforting thought that neither fascination nor the magic art can harm anyone who has firm faith in God, but for us the most important thing to note is that even in his theological writings he has associated magic with natural forces and the stars as well as with demons. In this he resembles William of Auvergne rather than the early Christian fathers.

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[1] *Summa,* II, 30, ii.

[2] *Sententiae,* II, 7, L, xii.

[3] *In Evang. Lucae,* XI, 15.

Good magic of the Magi.

Like some other Christian commentators, Albert exempts the Magi of the gospel story, who followed the star to Bethlehem, from the category of magicians in the evil sense that we have just heard him define magic. In his commentary upon the gospel by Matthew he asserts that "the Magi are not sorcerers (*malefici*) as some wrongly think." He also affirms that there is a difference between a Magus and a *mathematicus* or an enchanter or necromancer or *ariolus* or *aruspex* or diviner. Like Isidore Albert adopts the incorrect etymology of connecting Magus and *magnus*. But for him the Magi are not so called on account of the magnitude of their sins. "Etymologically the Magi are great men" whose knowledge of, or conjecture from, the inevitable processes of cause and effect in nature often enables them to predict or produce marvels of nature. In his commentary on the Book of Daniel Albert quotes Jerome's similar description of them as "masters who philosophize about the universe; moreover, the Magi are more particularly called astronomers who search the future in the stars." It is interesting to note that this view of the Magi still persists among Roman Catholics; the recent Catholic Encyclopedia still insists concerning the wise men who came to Bethlehem, "Neither were they magicians: the good meaning of μάγοι, though found nowhere else in the Bible, is demanded by the context of the second chapter of Matthew."

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[1] *Sententiae,* II, 7, viii.

But here is a still more interesting point to note: Albertus Magnus does not deny that the Magi were magicians. To contend that Magi were not *magi* was a contradiction of terms that was probably too much for his common sense. All that he tries to do is to exculpate them from the practice of those particular evil, superstitious, and diabolical occult arts which Isidore and others had included in their definitions of magic. From evil witchcraft and necromancy and fatalistic astrology, from augury and liver divination, from the arts of *sortilegi* and *pythones,* of enchanters "who by means of certain incantations perform certain feats with beasts or herbs or stones or images," or of diviners who employ geomancy or "the chance of fire" or hydromancy or aerimancy: from all such practices he acquits them. "They were not devoted to any of these arts, but only to magic as it has been described. And this is praiseworthy."[1] Thus Albert not merely defends the Magi, he praises magic; and we begin to see the fitness of the epithet, *Magnus in magia,* as applied to him.

Natural magic.

But how does this praiseworthy magic differ from the magic which he condemned in his *Summa* and commentary on the Sentences? Presumably in that its objects are good not evil, and that it does not make any use of demons. It would seem to resemble closely the natural magic of William of Auvergne. It is like evil magic in that both employ the forces of nature and the influences of the stars, but it is unlike it in that it employs them exclusively and is free from any resort to demons and also apparently from the use of incantations or the superstitious devices of geomancers and other diviners.

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[1] The Latin of the essential portions of these passages is as follows. *In Evang. Matth.,* II, 1. "Magi enim grammatice magni sunt. . . . Nec sunt Magi malefici sicut quidam male opinantur. Magus enim et Mathematicus et Incantator et Maleficus sive Necromanticus et Ariolus et Aruspex et Divinator differunt. Quia Magus proprie nisi magnus est, qui scientiam habens de omnibus necessariis et effectibus naturarum coniecturans aliquando mirabilia naturae praeostendit et educit. . . .

Incantator . . . qui carminibus quibusdam bestias aut herbas aut lapides aut imagines ad quosdam parat effectus. . . .

Divinatores autem multi sunt valde: in punctis terrae et casu ignis et aqua et in aere divinantes. . . .

Nulli istorum dediti fuerunt isti nisi magicis hoc modo prout dictum est. Et hoc est laudabile."

In Daniel., I, 20. "Magi dicuntur secundum Hieronymum quasi magistri qui de universis philosophantur, magi tamen specialiter astronomi dicuntur qui in astris futura rimantur."

Attitude in the scientific treatises.

If in his theological writings Albert thus distinguishes two varieties of magic, one good and one evil, one demoniacal and one natural, we need not be surprised if in his scientific treatises, where he is influenced mainly by Arabian astrology, the pseudo-Aristotelian treatises, the Hermetic literature, and other such writings rather than by patristic literature, he introduces yet a third conception of magic, which scarcely agrees with either of the others and yet has features in common with both. He nowhere in his commentaries on Aristotle or other works of natural science really stops and discusses magic at any length. But there are a number of brief and incidental allusions to it which imply that it is a distinct and definite branch of knowledge of which, although he himself does not treat, he gives no sign of disapproval. He also cites even enchanters and necromancers without offering any apology, and now seems to regard as sub-divisions of magic those occult arts from which we have just heard him exculpate the Magi.

Use of animals and herbs in magic.

In his treatise on animals Albert states that anointing a sleeper's temples with the blood of a hoopoe makes him see terrible dreams, and that enchanters value highly the brain, tongue, and heart of this bird. He adds, "But we shall not discuss this matter here, for the investigation of it belongs to another science,"—presumably to magic.[1] In his treatise on plants he says that certain herbs seem to have "divine effects"[2] which those who study magic follow up further. Examples are the betony, said to confer the power of divination, the verbena, used as a love charm, and the herb *meropis,* supposed to open closed seas, and many other such plants listed in the books of incantations of Hermes the philosopher and of Costa ben Luca the philosopher and in the books of physical ligatures. "Enchanter" (*Incan-*

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[1] XXIII, i, III.

[2] *De veget. et plantis,* V, ii, 6.

tator), apparently the author or title of a book, is cited more than once for the virtues of herbs, and what enchanters in general say is also mentioned.[1] "According to the testimony of the *praestigia* of the magi" the juice of a certain herb drunk in water makes a person do or say whatever the magician says or does.[2] Students of magic believe that the seed of another herb extinguishes lust.[3] Necromancers avow that betony indicates the future when plucked with an adjuration of Aesculapius,[4] and students of necromancy say that a man invoking demons should have a character painted on him with the herb Jusquiam,[5] and that gods invoked by characters and seals and sacrifices present themselves more readily if frankincense is offered them.[6] Such passages seem to indicate that Albert regarded occult virtues as largely the concern of magic, but that at least in necromancy the invocation of gods and demons also enters.

Magic stones.

Many allusions to magic occur in Albert's treatise on minerals, as the especially marvelous powers attributed to gems in antiquity might well lead us to expect. The magi, he tells us, make much use of the stone *diacodos,* which is said to excite phantasms but loses its virtue if it touches a corpse.[7] But such things do not come within Albert's present scope; he refers the reader for further information to the books of magic of Hermes, Ptolemy, and Thebith ben Chorath. The stone magnet is also stated in the magic books to have a marvelous power of producing phantasms, especially if consecrated with an adjuration and a character.

Magic images engraved on gems.

Albert twice assures us that the "prodigious and marvelous" powers of stones, and more particularly of images and seals engraved on stones, cannot be really understood without a knowledge of the three other sciences of magic, necromancy, and astrology.[8] He therefore will not in this treatise on minerals discuss the subject as fully as he might, "since those powers cannot be proved by physical laws (*principiis physicis*), but require a knowledge of astronomy and magic and the necromantic sciences, which should be considered in other treatises."[1] For the reason why gems were first so engraved he refers his readers to "the science of the *magi* which Magor Graecus and Germa of Babylon and Hermes the Egyptian were among the first to perfect, and in which later wise Ptolemy was a marvelous light and Geber of Spain; Tebith, too, handed down a full treatment of the art."[2] And in this science it is a fundamental principle that all things produced by nature or art are influenced by celestial virtues. Thus we comprehend the close connection of astrology and magic. As for necromancy, the third "science" involved, Albert's associates are curious to know the doctrine of images even if it is necromancy, and Albert does not hesitate to assure them that it is a good doctrine in any case. Yet in his theological writings he not only condemned necromancy, but declared the art of images to be evil "because it inclines to idolatry by imputing divinity to the stars, and . . . is employed for idle or evil ends."[3]

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[1] *De veget. et plantis,* VI, i, 32; VI, ii, 17; VI, i, 30; VI, ii, 3.

[2] VI, ii, 12.

[3] VI, i, 33.

[4] VI, ii, 3.

[5] VI, ii, 10.

[6] VI, i, 34.

[7] *Mineralium,* II, ii, 4.

[8] II, iii, 1.

Magic and alchemy; finding hidden metals.

Albert again refers to magic in his discussion of alchemy in the treatise on minerals, where he not only cites Hermes a great deal but refers to writings by Avicenna on magic and alchemy.[4] Albert holds that it is not the business of a physical or natural scientist (*physicus*) to determine concerning the transmutation of metals; that is the affair of the art of alchemy, which thus seems to lie outside the field of natural science upon the borders of magic. Similarly the problem in what places and mountains and by what signs metals are discovered falls partly within the sphere of natural science and partly belongs to that magical science which has to do with finding hidden treasure. Albert perhaps has the employment of the divining rod in mind.

The occult virtue of the human mind is another matter which Albert seems inclined to place within the field of

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[1] II, iii, 5.

[2] II, iii, 3.

[3] *Sentent.*, II, 7, ix and xi.

[4] *Mineralium*, II, i, 1.

Fascination and magic.

magic. In the treatise on minerals [1] he remarks that whether fascination is true or not is a question for magic to settle, and in his *On Sleep and Waking* [2] he cites Avicenna and Algazel as adducing "fascination and magic virtues" as examples of occult influence exerted by one man over another. It will be remembered that he cited the same authors anent fascination in his Commentary on the Sentences,[3] but there denied that fascination or magic could harm anyone who had firm faith in God, although he illustrated the possibility of potent human occult virtue exercised at will by the marvelous virtues exerted constantly by the sapphire and emerald. Peter of Prussia gives us to understand that Albert's belief was that fascination did not operate naturally but by the aid of demons; nevertheless certain men are generated at rare intervals who work marvels like the twins in Germany in Albert's time at whose approach bolts would open.[4]

Interpretation of dreams and magic.

Albert also regards the interpretation of dreams as especially the affair of magic. In one passage of *On Sleep and Waking* [5] he grants that probably the art of interpreting dreams cannot be acquired without a knowledge of magic and "astronomy." In a second passage [6] he speaks of the magicians as teaching the interpretation of dreams and the "astronomers" as talking of signs of prophecies, but not the sort of prophecy accepted among theologians. In a third passage [7] he defines the kind of dreams "which wise men interpret and for which was invented the art of interpretation in the magical sciences." Albert seems to have no particular objection, either moral or religious, to the interpretation of dreams, even if it is a branch of magic. Rather he censures Aristotle and other philosophers for not having investigated this side of the subject further, and he thinks that by physical science alone one can at least determine what sort of dreams are of value for purposes of divination and are susceptible to interpretation.[1] Magicians make great use not only of dreams but also of visions seen when one is awake but with the senses distracted.[2] The magicians indeed specialize in potions which clog and stupefy the senses, and thereby produce apparitions by means of which they predict the future.

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[1] II, i, 1 (Borgnet, V, 24).

[2] III, i, 6.

[3] II, 7, vii.

[4] *Petrus de Prussia* (1621), cap. XII or p. 135, citing the *De motibus animalium.*

[5] III, i, 1.

[6] II, i, 3.

[7] III, i, 10.

Magic and divination.

In this same treatise *On Sleep and Waking* Albert lists together "the astronomer and augur and magician and interpreter of dreams and visions and every such diviner." [3] He admits that almost all men of this type delight in deception and are poorly educated and confuse what is contingent with what is necessary, but he insists that "the defect is not in the science but in those who abuse it." Thus magic and divination in general are closely associated.

Summary of Albert's accounts of magic.

This last passage, like the connecting of enchanters and necromancers with magic which we have noted in a previous paragraph, is hard to reconcile with the passage in his commentary upon the Gospel of Matthew where Albert separated the Magi and magic from diviners, enchanters, necromancers, and their arts. So far as mere classification is concerned, Albert's references to magic in his scientific writings are in closer accord with his discussion of magic in the *Summa* and Sentences, where too he associated magic with the stars, with occult virtues, with fascination, and with images. But the emphasis which he there laid upon the evil character of magic and its connection with demons is now almost entirely lacking. Our attention is rather being continually called to how closely magic, or at least some parts of it, border upon natural science and astronomy. And yet we are also always being reminded that magic, although itself a "science," is essentially different in methods and results from natural science or at least from what Albert calls "physical science." Overlapping both these fields, apparently, and yet rather distinct from both in Albert's thought, is the great subject of "astronomy" which includes both the genuine natural science and the various vagaries of astrology. It is all like some map of a feudal area where certain fiefs owe varying degrees of fealty to, or are claimed by, several lords and where the frontiers are loose, fluctuating, and uncertain. Perhaps the rule of the stars can be made to account for almost everything in natural science or in magic, but Albert seems inclined to leave room for the independent action of divine power, the demons, and the human mind and will. But his attitude to the stars and to astrology will be considered more fully later; we shall first examine in more detail his own attitude towards marvelous virtues in inferior nature and towards some of the other matters which he has located expressly or by implication along the ill-defined frontier of "magic and astronomy." In concluding the present section let us make the one further observation that while Albert describes magic differently and even inconsistently in different passages, it is evident enough that he is trying to describe the same thing all the time.

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[1] III, i, 1.

[2] III, i, 3.

[3] III, ii, 5.

IV. *Marvelous Virtues in Nature*

Properties of the lion.

So many instances have already been given from other authors of the occult virtues ascribed to parts of animals that we shall note in Albert's treatise on animals only two or three passages, chiefly for purposes of comparison. The properties which he ascribes to the carcass of the lion,[1] for instance, bear a certain resemblance to Pliny's paragraph on its medicinal virtues and to Thomas of Cantimpré's compilation concerning it, yet are considerably different. Its fat is hotter than that of other animals, and they flee from anyone who is anointed with it, while fumigation therewith keeps wolves away from sheep. A diet of lion's flesh benefits paralytics. Garments wrapped in its skin are secure from moths, and the hair falls out of a wolf's skin which is left near a lion's skin. If the tooth of a lion which is called *caninus* is suspended about a boy's neck before he loses his first teeth, he will be free from toothache when his second teeth come. Lion's fat mixed with other unguents removes blotches, and rubbing cancer with its blood cures that disease. Drinking a little of its gall cures jaundice; its liver in wine checks pain in the liver. Its brain, if eaten, causes madness; but remedies deafness, if inserted in the ear with some strong oil. Its testicle, administered pulverized with roses, causes sterility—a case, it would seem, of sympathetic magic operating by contraries. But no doctrine of sympathy and antipathy is needed to explain the further assertion that its excrement drunk with wine makes one abhor wine.

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[1] *De animalibus*, XXII, ii, 61.

Nasty recipes: illusory lights.

The last two items are very characteristic of Albert's section on quadrupeds, where the medicinal and other properties of such parts as *stercus, virga,* and *testiculus* are incessantly mentioned, and are sometimes used in charms, as in the following: "Si virga lupi in alicuius nomine viri vel mulieris ligetur, non poterit coire donec nodus ille solutus fuerit." [1] The saliva of a fasting human being cures abscesses and removes scars and blotches.[2] It kills serpent or scorpion, if it falls into its mouth or wound so as to reach its inner parts. If the tip of an arrow or sword has touched the lips of a fasting man, it inflicts a poisonous wound, say those who have tested it. Others say that if the wax and dirt from dogs' ears are smeared on wicks of new cotton, and these are placed in a crucible in green oil and lighted, the heads of persons present will appear entirely bald.[3] This sort of half-magical, half-chemical experiment with various combustible or illuminating compositions, which are supposed to produce optical or other illusions, is not infrequently met with in medieval manuscripts, especially alchemical ones, and we shall in a later chapter encounter further specimens thereof in works ascribed to Albert himself.

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[1] XXII, ii, 67.

[2] XXII, i, 5.

[3] XXII, ii, 18.

Dragons.

Albert is rather unusually sceptical concerning dragons, which are generally the theme of so many marvelous stories. That a dragon is large enough to crush an elephant with a twist of its tail, that the Ethiopians eat the flesh of dragons to cool themselves, that dragons are afraid of thunder and therefore enchanters imitate it with drums in order to capture dragons and ride on them through space,[1]—all such assertions Albert treats as rumors rather than tested facts. He also suggests that meteors or flaming vapors have been mistaken for dragons flying through the air and breathing forth fire. We have already, however, heard his tale of a serpent with a human face.

The basilisk.

Albert still believes, moreover, that the mere glance and hiss of the basilisk are fatal. But while the reptile's glance will kill as far as its vision extends, its hiss is not fatal as far as it can be heard but only as far as it is propagated by the basilisk's breath.[2] Albert rejects as neither true nor reasonable Pliny's assertion that if a man sees a basilisk first, his glance is fatal to it. "Nor do Avicenna and Semerion, philosophers who tell what they have experienced, mention this." But Albert repeats Pliny's story of the horseman who was killed by touching with the end of his long lance a corpse slain by a basilisk. He rejects, however, as false and impossible the notion that the basilisk is generated from a cock's egg, and the books of wise philosophers do not support the assertion that there is a flying variety of basilisk. But scattering the ashes of a basilisk expels spiders and other venomous creatures, and hence in antiquity its ashes were scattered in temples. Hermes says that silver rubbed with its ash takes on the splendor and weight and solidity of gold; Hermes also teaches that the basilisk is generated in glass, but Albert interprets this as an allusion to some alchemical elixir by which metals are transmuted.

Very amusing are the detailed recipes for every ailment of the birds in the chapters on the infirmities of falcons,[3]

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[1] XXV, i, 26.

[2] XXV, i, 13.

[3] XXIII, i, 40 (17-23).

Remedies for falcons and mad dogs.

These appear to be culled chiefly from the works on falconry of the Emperor Frederick and of King William, one of the Norman line which preceded him in the kingdom of Sicily. To make the birds fierce one is advised to feed them flesh soaked in urine. If a falcon develops a cataract, one should inject into its eye a mixture of pulverized fennel seed and the milk of a woman bearing a male child. Several prayers and incantations are recommended for use when taking up the falcon in the morning, when releasing it in fowling, and in order to preserve it from injury from eagles. In the last case the words to be repeated are, "Leo conquers of the tribe of Judah, root of David, Alleluia." Albert adds, however, "But these last items," meaning probably the incantations, "are not so reasonable as the first," meaning probably the more purely medicinal directions. Equally diverting is a cure of a mad dog borrowed by Albert from a king of Valencia. For nine days the hound should be so immersed in hot water that his hind legs barely touch the ground while his fore legs are held erect. After that his head should be shaved and his hair well plucked out so that the skin is wounded. Then he should be anointed with beet juice and ducked often and soaked in the same juice. "And if he eats anything, give him some pith of the elder tree, for it will do him good. And if this treatment fails to benefit him within the space of seven days, kill him, for he is incurable."[1]

Habits and remedies of animals.

Albert's treatise on animals not only ascribes marvelous properties and medicinal virtues to various portions of their carcasses, but also continues to some extent the tradition of crediting them with semi-human intelligence and medical knowledge. Albert discredits, however, the report of the adultery of the lioness with the leopard and her craftiness in concealing it, and he also rejects as contrary to the wise provision of nature the statement that the lion suffers continually from quartan fever.[2] But he believes that a sick lion cures itself by eating an ape or drinking the blood of a dog. Even the tortoise (*tortuca?*), although it seems to Albert a sort of reptile and lacking in "noble virtues of the soul," yet from mere natural sagacity eats wild origanum after it has eaten the viper in order to overcome the chill of the venom by the heat of the herb.[1] And someone in Aristotle's time learned by experience that it will not eat a viper except in a place where this herb is available, and that if the herb is removed while it is eating the viper it will die from want of it. Avicenna tells a similar experience of an old man who was an experienced hunter and deserving credence. He saw a bird of slow movement and weak flight fighting with a viper. As often as it was wounded, it would retreat, eat some of a certain herb, and then return renewed to the fight. The observer covertly removed the herb and when the bird returned again and failed to find it, it raised a great outcry and died. From the old hunter's description of the plant's shape and color Avicenna judged it to be wild lettuce (*lectuca agrestis*).

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[1] XXII, ii, 18.

[2] XXII, ii, 61.

The virtues of herbs.

Thus the remedies employed by animals bring us to the virtues of herbs. The "divine effects" of certain plants, as we have seen, Albert regards as lying within the province of magic rather than that of his treatise on plants, but he mentions a few, such as that planting a certain herb on the roof protects the house from lightning,[2] and that carrying another stirs up quarrels and hatreds,[3] while a woman who wears a third about her neck will not become pregnant.[4] But he believes that there is strong virtue in herbs in general. Their elemental qualities are unusually acute and closely akin to the excellencies of the pure elements. They grow close to the ground and "recede less from the first fertilizing humor in the earth."[5] In them matter predominates more and the form of the vegetable soul is less developed than in other kinds of vegetation. Consequently they are more efficacious in altering other bodies and are used by physicians more than any other class of remedies.

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[1] VIII, ii, 2.

[2] *De veget. et plantis*, VI, ii, 3.

[3] VI, i, 32.

[4] VI, ii, 17.

[5] VI, ii, 1.

Their medicinal use.

Most, indeed, of the virtues of herbs mentioned by Albert are medicinal. Sometimes the method of applying them is injudicious, as when a root of parsley is hung from the neck to cure toothache, or artemisia is bound to the legs to prevent wayfarers from feeling weariness.[1] More often, however, our criticism is that the same disease is represented as curable by too many different plants, or that a single herb is made a cure for a long list of very miscellaneous and unrelated ills, not content with which Albert often concludes, "And it has many other effects." Selecting an example at random, we may note what he says of the nasturtium.[2] "It possesses acidity, is hot and dry, acts as a gentle purgative and laxative, and dries up the putridity of an empty belly. Used as a potion and liniment, it keeps the hair from falling out. Combined with salt and water, it helps abscesses and carbuncles, and mixed with honey, it eradicates Persian Fire and is good for all softening of the muscles. It purifies the lungs and relieves asthma by its sharp, cutting qualities. It warms the stomach and liver and cures enlarged spleen, but its disturbing quality is bad for the stomach. *Auget coitum et multiplicat menstrua et eiicit foetum, sed tamen si non teratur et confringatur, retinet ipsum.* It is good for venomous bites, and if carefully prepared, works many other effects."

Occult virtue of herbs due to the stars.

According to Albert the properties of plants are produced by the combination of five virtues: that of the element which preponderates in the composition of the plant, the cooperating virtue of the other elements which are mixed with it, the virtue of the proportion in which they are mixed, the influence of the stars, and the virtue of the vegetable soul. "The virtue of the place (where the plant grows) and the virtue of the surrounding air are also effective, but they do not enter into the plant's nature so essentially as the aforesaid five virtues."[3] "Its specific form," upon which its occult virtues largely depend, is given to the plant by the motion of the heavens, especially by the movement of the planets through the circle of the zodiac,[1] and their position in relation to the fixed stars. Plants receive this influence at the time of their formation, when vapors, potentially seminal and formative, ascend from the depths of earth and meet the dewy air as it descends.

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[1] VI, ii, 2.

[2] VI, ii, 13.

[3] V, ii, 1.

Occult virtue of stones.

It is unnecessary to repeat the marvelous powers attributed to particular gems and stones by Albert in his treatise on minerals, since they are either copied from or similar to those of Marbod, Costa ben Luca, and Constantinus Africanus. What, however, he has to say on the general subject of their occult virtue is worth noting. He states that many doubt if stones really have such powers as to cure ulcers, counteract poisons, conciliate human hearts, and win victories. Such sceptics contend that a compound substance like a gem can exert only such powers as one can account for from the elements which enter into its composition and the composition itself. Albert grants that the wonders worked by means of stones seem "more prodigious and marvelous" than those produced by simple substances, that the physical constitution of stones does not seem to justify the existence of such powers in them, and that "the cause of the virtue of stones is indeed occult." But he maintains that such occult virtues are well established by experience, "since we see the magnet attract iron and the adamant restrict that virtue in the magnet."[2] Albert has seen with his own eyes a sapphire which removed ulcers.

Due to the stars.

Albert finds that students of nature (*physiologi*)—it will be noted that the word cannot possibly refer here to the authors of such works as the *Physiologus*—have assigned very diverse causes for this marvelous virtue of stones. He rejects as "most absurd" the suggestion of certain Pythagoreans that it is due to the action of souls or of a world-soul in stones. Alexander Aphrodisiensis argues from the operations of alchemy that some chemical change makes the compound stone far more potent than any or all of its constituents. Plato thinks that all inferior objects are imbued with superior ideas; Hermes and Avicenna suggest that celestial virtue is responsible. Albert himself concludes that the occult virtue of stones resides in their specific forms, in which, as in the case of herbs, the influence of the stars plays the chief part. Albert's discussion of the virtue of gems is repeated in a *Summa philosophiae* ascribed to Robert Grosseteste, but in part at least written after his death. The author regards "Albert of Cologne" as having "spoken more certainly than others in this matter." [1]

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[1] VI, ii, 22.

[2] *Mineralium*, II, i, 1.

Pseudo-Albert *De lapidibus.*

Albert's discussion of the engraving of images and seals on stones in his treatise on minerals has already been mentioned in connection with his attitude toward magic and will come up again in connection with his attitude towards astrology. Besides the treatise on minerals there seems to be another work on stones ascribed to Albert which is spurious. It deals with the colors and virtues of stones, and, like Thetel and the fourteenth book of Thomas of Cantimpré, with their sculpture and consecration.[2]

Alchemy.

In his third book concerning minerals Albert judiciously discusses alchemy, citing Avicenna and Hermes especially. He says that of all the arts alchemy most closely imitates nature.[3] Albert regards the various metals as distinct species, and hardly accepts the assertions of Hermes, Gilgil, Empedocles, and other alchemists that in each metal there are several species and natures, one manifest and another occult,[1] one external and another internal, one superficial and another deep. Albert then considers the remark of Avicenna, incorrectly ascribed by some to Aristotle, that the alchemists cannot alter species but can make them appear alike, as when they color copper so that it seems to be gold.[2] Avicenna has also remarked in his *Alchemy,* however, that species can perhaps be reduced to first matter and then by the aid of the art formed into the species of the desired metal. Albert thinks that perhaps, as physicians by their medicines purge away corrupt matter and afterwards restore health, so skilled alchemists may purify a great mass of quicksilver and sulphur, which according to Avicenna are the material constituents of all metals, and then combine these in due ratio of elemental and celestial virtues for the composition of the metal which they wish to obtain.[3] But those who merely color the metal white or yellow, while the species of the baser metal remains in the material, are beyond doubt deceivers and do not make true gold or true silver. Unfortunately all alchemists proceed in this fashion to a greater or less extent, and Albert has subjected gold made by them to fire and has found that it is finally consumed, after it has stood the test of fire perhaps six or seven times.

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[1] Tract., XIX, cap. 6 (ed. Baur, pp. 633-34).

[2] I have not examined the work itself, but append the following notice of a MS of it: Corpus Christi (Cambridge), 243, 13-14th century, Pseudo-Albert de lapidibus; fol. 1-, Incipit liber de coloribus et virtutibus lapidum, Liber primus, including a prologue and then an alphabetical arrangement of stones; fol. 20v-, De sculturis de omnibus lapidibus; fol. 21v-, Liber II, de natione et ubi inveniuntur; fol. 27-, Liber III, de sculturis lapidum; fol. 40v-, Liber IV, de consecratione lapidum; fol. 44-, Liber V, de confectione et compositione lapidum.

There is said to be another copy at Glasgow in Hunterian, V, 6, 18.

I am not sure whether CUL 1175, 14th century, fols. 1-3, "Albertus de Colonia de lapidibus," is a fragment of it or of the genuine treatise on minerals.

In CLM 353, 13th century, the *Liber de mineralibus* of Albertus Magnus at fol. 69 is preceded at fol. 55 by *Lapidarius* (*deest lib. I, tract. i*) also ascribed to him.

In the notice of CLM 16129, 14th century, fols. 25-112, Alberti Magni tractatus de passionibus aeris et impressionibus vaporum in alto, de mineralibus, de imaginibus lapidum et sigillis, de natura metallorum, it is scarcely clear whether *De imaginibus lapidum et sigillis* is a separate treatise from the *De mineralibus* or only the portion of it dealing with astronomical images.

[3] III, i, 2.

Albert thus suggests that the transmutation of metals by means of human art is possible, although he does not regard the alchemists as having yet employed the right method. But it is hard to see how Peter of Prussia got the notion that Albert had condemned the art of alchemy in the *De mineralibus* and could not be the author of a treatise on the subject.[4] In other passages Albert speaks of alchemy without disapproval and apparently with respect. He cites "alchemical experiments" concerning the evaporation of water when heated.[5] He repeats the argument of Alexander of Aphrodisias that the occult virtues of gems are due to the mixture of the elements in them, as is proved by the operations of alchemy, in which simple substances effect little, but when mixed together produce truly marvelous effects.[1] And as one instance of the influence exerted by the moon he states that skilled alchemists work during the waxing of the moon because then they produce purer metals and purer stones, especially when they are really expert and do not hurry their operations but await the opportune time when the process will be aided by celestial virtue.[2] On the whole, however, as these passages show, Albert's mentions of alchemy are mainly allusive. He does not treat of it fully in his Aristotelian treatises apparently because, as we saw earlier, he regarded it as a separate subject from physics or physical science, bordering more on the field of natural magic. The question therefore next arises whether he ever wrote a work or works dealing especially with alchemy, just as the question will arise whether he ever wrote any works in the field of natural magic.

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[1] *Mineral,* III, i, 8.

[2] *Ibid.,* III, i, 9.

[3] *Ibid.,* III, i, 4.

[4] *Vita Alberti,* cap. 16.

[5] *Mineral.,* III, i, 2.

Works of alchemy ascribed to Albert.

Berthelot gives the impression in his *La Chimie au Moyen Age*[3] that there was but one alchemistic treatise current under the name of Albertus Magnus. This he describes as a serious and methodical work but written a little after Albert's time. But the manuscripts seem to contain several, or rather, nearly a dozen, different works of alchemy ascribed to Albert.[4] In the University library at Bologna alone there appear to be six different alchemistic treatises ascribed to Albert, and three of them in one manuscript.[5]

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[1] *Mineral.*, II, i, 5.

[2] *De causis elementorum*, I, ii, 7 (Borgnet, IX, 615).

[3] I, 290.

[4] Most of them I have not been able to examine or compare; but where the opening and closing words are given in the catalogues, they differ as well as the titles. It is possible, however, that some of them may be parts of the other treatises.

[5] MS 138, 15th century, fols. 171-83, "Semita recta fratris Alberti Magni"; fols. 233-5, "Speculum secretorum philosophorum Alberti Magni de secretis naturae," opening, "Ad instructionem multorum" and closing, "penuriam librorum"; fols. 235-7, "Liber xii aquarum Alberti Magni," opening "Ovorum vitella," and closing, "omne corpus."

In the same library MS 139, 14th century, besides the *Semita recta* at fols. 3-35—this time Albert is not named as its author—occurs at fols. 107-21, "Incipit

In one manuscript of the British Museum is a rather lengthy "*Practica* of Brother Albert in alchemy which is called by the same the Secret of Secrets," in seven books. The text, however, cites Albert's work on minerals, stating that the Latins in general have discovered very little for themselves experimentally in alchemy but have been dependent upon translations from other languages, but that "Albert, once of Ratisbon, the crown of the Latins," studied it and discovered some secrets by experimentation, as he bears witness in his *De mineralibus*."[1] Presently Albert is again cited in a list of old masters who labored at this art, Alexander the Great, Dioscorides, and others.[2] In another manuscript at the British Museum is a much briefer *Of the hidden things of nature* ascribed to Albertus Magnus.[3] What seems to be still another brief tract on alchemy ascribed to Albert occurs in a manuscript at Cambridge. It concludes with the statement, "And I Albert say that I have tested these two operations and that there is no other perfect work by me except these two works, and they are true. Euclid, too, and many philosophers agree with me and assert that all the value of this art consists in Mercury and the Moon and in Mercury and the Sun, and you should know that all others are vain and illusory. Thanks to God." [4]

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libellus ab Alberto compositus. Quoniam ignorantis . . . / . . . dum regnat Iupiter."

Also in MS 270, II, 15-16th century, fol. 77, "Alberti Magni Alchymia. Callixtenes unus philosophorum . . . / . . . siccum."

In MS 270, X, at fol. 99 the *Speculum secretorum*, etc., is again ascribed to Albert; and in MS 270, XV, fol. 3-, is "Ars experimentorum Alberti Magni. Sciendum vero . . . / . . . viscositate malve."

[1] Sloane 323, 14th century, fols. 1-84, "Practica Fratris Alberti in alchimiam, que ab eodem dicitur sec. sec." The work is said to have been printed in the *Theatrum Chymicum*, II, 423.

[2] *Ibid.*, fol. 8r. The previous citation of Albert was at fol. 7v.

[3] Arundel 164, written in 1422, fols. 127v-131, "De occultis nature," opening, "In mutue allocutionis tractatu," and closing, "sicut qui cum arcu sine torta sagutur (sagittur?) deo gratias.'

[4] CUL 220, 16th century, occupying two leaves in an alchemical miscellany. It opens, "Aqua Mercurius et oleum sulphuris. Opus istud multis diebus abscondebatur. . . ."

Possibly the following are also distinct treatises, but I do not have their *Incipits* and *Explicits:* CLM 12026, 15th century, fol. 32, Alberti de Colonia ars alchymiae; Wolfenbüttel 676, anno 1444, following the *Semita recta* at fols. 34-36, Varia Alberti Magni chymica; Riccard. 119, following the *Semita recta*, which is # 32 in this

A more detailed description of one of them: preface.

Of these various treatises in alchemy ascribed to Albert we shall now consider in more detail the one which has been included in editions of his works,[1] and which is perhaps the most likely of any of them to be genuine. It is ascribed to Albert in a manuscript list of the writings of Dominicans drawn up before 1350, and also by Pignon.[2] It is also an unusually intelligible treatise for a work of alchemy and so the better lends itself to description and summary. After opening in devout tone with praise of God and invocation of His aid, the author proceeds to tell in somewhat Albertine style how he has traversed many regions, provinces, cities, and castles with great labor for the sake of the science which is called alchemy, and has diligently inspected the books on the subject by men of erudition and learning, but has found nothing true in them. He has also encountered "many very rich men, scholars, abbots, *praepositi,* canons, physicians, and illiterate persons," who have expended much money and toil without result. He did not despair, however, but went to infinite expense and labor, keeping his eyes open and constantly moving from place to place, until at last he found what he sought "not by any science of mine but by the grace of the Holy Spirit." He therefore, the least of philosophers, intends to write to his friends and associates concerning this art, true, easy, and infallible, yet so that seeing they shall not see and hearing they shall not understand. And he adjures them to keep it secret and not to show his book to the foolish.

Experimental method and equipment.

After this preface, the first of the fifty-seven chapters, for the most part brief, into which the treatise is divided, lists various "errors" which have made the previous efforts of alchemists a failure. The author also strikes an experi-

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miscellany, comes ♯33, an *Alchimia* ascribed to Albertus Magnus, while the second treatise bearing ♯37 (at fol. 177r) is *Alberti quidam Tractatus.*

[1] It is included in vol. 21 of the edition of Lyons, 1651, by R. P. Jammy; and by Borgnet, vol. 37; 545-73, Alberti Magni libellus de alchimia. It had previously been printed at Basel, 1561, and Urcellis, 1602-1608, *Theatrum chemicum,* pp. 485-527. It is the same as the treatise called *Semita recta* in the MSS. Another MS of it is Corpus Christi 226, 15th century, fols. 59-69.

[2] See Denifle (1886), 236.

mental key-note for his work, stating that after seeing so many fail he has decided to write true and approved works and the best which all the philosophers have to offer, works furthermore in which he has labored and which he has tested by experience, and he will write nothing but what he has seen with his own eyes.[1] After suggesting a derivation for the word "alchemy" [2] and a theory for the origin of metals and "proof that alchemy is a true art," [3] the author lays down eight precepts for alchemists to follow. The alchemist should work silently and secretly or he may be arrested as a counterfeiter. He should have a laboratory, "a special house away from the sight of men in which there are two or three rooms in which experiments may be conducted." [4] He must observe time and seasons; the process of sublimation, for instance, cannot be successfully performed in winter. He must be a sedulous, persevering, untiring, and constant worker. In his operations he must observe due order: first *contributio;* then *sublimatio;* third, *fixio;* fourth, *calcinatio;* fifth, *solutio;* sixth, *coagulatio;* processes which are further explained in chapters 30 to 35. All the vessels which he uses should be made of glass. He should fight shy of princes and potentates, and finally, should have plenty of money. Chapters four to eight then deal with the subject of furnaces, and chapter nine tells how to glaze clay vessels.

Differences between transmuted and natural metals.

In the tenth chapter, besides discussing what are the four "spirits" of metals which dye or color, the author states his opinion as to the extent to which metals can be transmuted. He believes that metals can be produced by alchemy which are the equal of natural metals in almost all their qualities and effects, except that the iron of alchemy is not attracted by the stone adamant, and that the gold of alchemy does not stimulate the human heart or cure leprosy, while a wound inflicted by it swells up as one made by natural gold would not do. "But in every other operation, hammering, testing, and color, it will endure forever." In the two following chapters the author discusses what the Elixir is and the kinds of medicines.

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[1] "Videns ergo tot errare iam decrevi scribere vera et probata opera et meliora omnium philosophorum in quibus laboravi et sum expertus nihil aliud scribam nisi quod oculis meis vidi." Or perhaps he means that his works are better than those of all the philosophers.

[2] "Alchimia est ars ab Alchimo inventa et dicitur ab archymo Graece quod est massa Latine," cap. 2.

[3] Cap. 3, "Probat artem Alchimiae esse veram." This done, however, the chapter continues with the eight precepts which follow.

[4] "domum specialem extra hominum conspectum in qua sint duae camerae vel tres in quibus fiant operationes."

Substances and processes of alchemy.

A number of chapters are next devoted to description of various minerals, chemicals, dyes, and coloring matter, such as mercury, sulphur, orpiment, arsenic, salts of ammonia, common salt, various other salts, azure, minium, ceruse, and so on. We are then instructed in various processes such as whitening quicksilver or sulphur or orpiment or arsenic, the making of powders, solutions, and distillations, leading up finally in the last two chapters to two brief recipes for the making of the precious metals. The general plan of this treatise is one to which many others conform; it is noteworthy further for the absence of mysticism and magic procedure.

Ligatures and suspensions.

We have already noted in Albert's works some instances of marvels worked by herbs bound to the body or suspended from the neck. In his treatise on plants he cited books concerning physical ligatures[1] for the divine effects of plants with which magic is especially concerned. But in his treatise on minerals, after stating that the marvels worked by images engraved on gems cannot be explained by the laws of physical science but require a knowledge of "astronomy" and magic and necromancy,[2] he adds that ligatures and suspensions of stones seem to operate naturally and belong more to physical science.[3] He cites, however, Socrates, probably through the medium of Costa ben

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[1] Since he had just mentioned "the books of incantations of Hermes the philosopher and Costa ben Luca," he very likely had in mind simply the Letter of the latter on Incantation, Adjuration, and Suspension from the Neck, of which we have previously treated, and which Albert uses for physical ligatures in his treatise on minerals.

[2] II, iii, 5.

[3] II, iii, 6.

Luca, to the effect that ligatures and suspensions are one of four kinds of incantations, and that they affect the mind, depressing or elating it and so affecting the health of the body. This half-sceptical attitude seems to influence Albert little, for he states that for the present he intends to treat only of ligatures and suspensions of stones, of which he proceeds to list examples for a page and a half drawn largely from Costa ben Luca's treatise. In his work on animals Albert again quotes Costa ben Luca to the effect that dogs will not bite the wearer of a dog's heart.[1] Others say that they will not bark at one who holds in his hand the tooth of a black dog, "and so robbers carry such a tooth with them at night." Albert further finds in the book of sixty animals—probably the work ascribed to Rasis—that dog's teeth should be suspended from the neck of a patient suffering from jaundice.

Incantations.

Albert does not expressly discuss the power of words or incantations. It is rarely that he repeats any incantations, and it will be remembered that those which he quoted from books on falcons were accompanied with a word of caution. His belief in the power of characters or images engraved on gems may be best discussed in connection with his attitude towards astrology.

Fascination.

The power of fascination possessed by one human being over another is touched upon by Albert in three different treatises.[2] We have already heard him identify it with magic. He cites certain Pythagoreans as affirming that the soul of a man or other animal can act upon another, fascinating it and impeding its working. He quotes Hermes as telling Esclepius that man is so endowed with divine intellect and raised above the world, that its matter follows his thought, and so the sage can work transformations and miracles in nature or fascinate another person through sight or some other sense. Avicenna and Algazel "say that souls can in so far conform to the celestial intelligence that it will alter material bodies at their pleasure, and then such a man will work wonders." It is not clear, however, to what extent Albert agrees with the authorities he has cited; he remarks that the power of the soul in fascination can scarcely be proved by philosophy, but he perhaps simply means that it can be proved by magic.

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[1] XXII, ii, 18.

[2] *Mineral.*, II, i, 1; *De animalibus*, XXII, i, 5; *De somno et vigilia*, III, i, 6.

Physiognomy.

In a passage of his treatise on animals[1] Albert describes physiognomy as a science which divines a man's character from the physical form of the various parts of his body. He explains, however, that the configuration of one's physical features does not absolutely force one to a corresponding course of action. Thus he upholds human free will against a mechanistic view of man, or rather he shows that the physiognomists themselves do. He cites Aristotle, to whom we have seen that a treatise on physiognomy was ascribed, for the following story: The disciples of Hippocrates made a perfect image of him and submitted it to an excellent physiognomist, who declared it the likeness of a man given to luxury, deceit, and lusts of the body. The disciples were angered at this slur upon the character of their master, who they knew lived a sober and upright life; but Hippocrates himself told them that the physiognomist had judged aright as to his natural traits, and that it was only by love of philosophy and integrity and a life of study and effort that he had triumphed over nature. A treatise on chiromancy is ascribed to Albert in more than one manuscript.[2]

Aristotle on divination from dreams.

In the third book of his *De somno et vigilia*[3] Albert complains that Aristotle's treatment of divination from dreams is unsatisfactory; being "brief, deficient in proof, naïve, unphilosophical, imperfect," and having "many doubtful points because it leaves the causes of such dreams uncertain." Aristotle's attitude was in fact a vacillating one, since he found it "not easy either to despise or to believe" in that kind of divination. Yet Roger Bacon tells us that one reason why the study of the books of Aristotle on natural philosophy was forbidden at Paris before 1237 was this third book of his *De somno et vigilia* dealing with divination from dreams.[1] But perhaps this was because of commentaries of Averroes which accompanied it or errors in translation of which Bacon speaks.

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[1] I-ii-2.

[2] CLM 916, 15th century, fols. 25-30, Chiromantia Alberti: BN 7420A, 14th century, # 15, Alberti de Colonia ars chiromantiae.

[3] I presume that Vienna MS 2448, 14th century, 26 fols., "Expliciunt interpretaciones sompniorum reuerendi domini Magni Alberti Parisiis conscripta" is simply this third book, but perhaps it is some spurious treatise. MS 1158, 14th century, in the University Library at Bologna, fols. 41-52, catalogued as "Magistri Alberti theotonici de fato, de divinatione, de sortibus," consists of the *De fato* ascribed to Aquinas; a second treatise *De fato* which in the MS itself is headed in the upper margin of fol. 45r, "Magri (Magistri) Alexandri"; a "Questio de divinatione Alexandri," at fol. 47r; and an anonymous *De sortibus*.

Albert on divination from

Little as Aristotle said, he came nearer the truth in Albert's opinion than any other extant philosophers, among whom there is great diversity of view. However, that dreams are prophetic "is no idle report but the testimony of experience,"[2] and Albert thinks that there is scarcely anyone who has not been warned in his dreams of many future events. "Socrates put great faith in divination from dreams."[3] Interpretation of dreams is necessary, for dreams cannot be exact images of future events, since these are as yet non-existent.[4] Predictions from dreams, even if correctly made, do not invariably come true, just as medical prognostications and the predictions of augurs—of whom we are surprised to hear Albert speak approvingly—sometimes fail owing to the arising of some conflicting cause.[5] The dreamer must be free from care and passion. Albert agrees with Aristotle that dreams requiring interpretation do not come from God but have a natural cause; while the future cannot be foretold from dreams which have an accidental cause.[1] More specifically he finds the cause of dreams not, like Socrates and Plato, in demons and corporeal and incorporeal gods,[2] nor, like Democritus, in atoms streaming from the stars through the pores of the dreamer into his inmost soul, but in the motion of the stars acting upon the body of man, who is in a sense a microcosm or image of the universe (*imago mundi*).[3] The interpreter of dreams must be quick to see associations and similarities from the realm of nature and of art, he must understand astronomy and astrology, and the state of health and mind of the dreamer.[4] Albert again discusses divination from dreams in much the same way in the second part of his *Summa de creaturis* and in his *De apprehensione*.[5]

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[1] Extract from the *Compendium studii theologiae,* quoted at page 412 of Charles' Life of Roger Bacon. "Tarde venit aliquid de philosophia Aristotelis in usum Latinorum, quia naturalis philosophia eius et metaphysica cum commentariis Averrois et aliorum libris in temporibus nostris translatae sunt, et Parisiis excommunicabantur ante annum Domini 1237 propter aeternitatem mundi et temporis, et propter librum 'De divinatione somniorum' qui est tractatus 'De somno et vigilia,' et propter multa alia erronea translata." It is found in Rashdall's edition of the *Compendium studii theologiae* at pp. 33-4.

[2] III, i, 2.

[3] III, i, 1.

[4] III, i, 4.

[5] III, ii, 5.

Augury.

In the *De somno et vigilia* he mentions one further variety of vision "when the celestial influence is so strong that it affects even while awake one whose attention is not occupied by the distractions of sense." Such visions move the bodies of animals even when they are awake, "and then their movements have some future signification, which augurs endeavor to note and interpret. On so much ground of reason is divination by augury based." [6]

V. *Attitude Toward Astrology*

His emphasis upon the influence of the stars.

We come finally to that influence of the heavens and stars which makes the art of augury and divination from dreams possible, which serves to explain the occult virtue of herbs and stones, and to that "astronomy," or astrology as we should say, which is so closely associated with the science of the magi and with necromancy. Albert's astrological views crop out in almost all his scientific treatises rather than merely in those dealing with astronomical subjects, such as the *Meteorology*, the *De coelo et mundo*, and the *De causis et procreatione universi*. Especially astrological in character is the treatise *On the Causes and Properties of the Elements and Planets.*[1]

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[1] III, ii, 3-4.
[2] III, i, 8-9.
[3] III, ii, 6.
[4] III, ii, 9.
[5] VI, 12.
[6] III, i, 10.

Problem of the authorship of the *Speculum astronomiae.*

Another treatise very important in the history of astrology is the *Speculum astronomiae,* hitherto usually placed among Albert's works [2] but recently declared by Father Mandonnet [3] to be the work of Roger Bacon. Although Mandonnet adduced no evidence of manuscripts in favor of the Baconian authorship, other students of Roger Bacon [4] have since unquestioningly accepted this attribution of the *Speculum* to him, but I shall show that there is no good reason for it. This may best be done, however, by delaying our consideration of the *Speculum astronomiae* itself until after we have taken up Roger Bacon and his views. But in our present discussion of Albert's other writings we may break the backbone of Mandonnet's argument, which is his extraordinary contention that Albert did not believe in astrology and that Roger Bacon was "the only ecclesiastical author in the second half of the thirteenth century who has undertaken the defense of judicial astrology and of the other occult sciences which depend more or less directly upon it." [5] Mandonnet criticized Charles for saying of Roger Bacon's astrological views, "These doctrines, which seem contemptible to us, were widespread in the thirteenth century; Albert was not free from them; St. Thomas merely expressed some reservations but did not deny the science."

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[1] I have not seen CUL 1705, 14th century, fols. 181v-183, "Albertus de naturis signorum," opening, "Deus utitur corporibus celestibus" and closing "Saturnus enim tenebras significat." It is not included in Albert's printed works and is perhaps not by him.

[2] See chapter 62 below for bibliography.

[3] In his *Siger de Brabant et l'averroisme latin au XIIIe siècle, deuxième édition revue et augmentée,* Louvain, 1911, I, 244-48; and more fully in an article, "Roger Bacon et le 'Speculum astronomiae,'" in the *Revue Néo-Scolastique,* vol. 17, August, 1910.

[4] Theophilus Witzel in an otherwise excellent article on Roger Bacon in the *Catholic Encyclopedia;* A. G. Little, *Roger Bacon Essays,* Oxford, 1914, p. 25; Paschal Robinson, "The Seventh Centenary of Roger Bacon," *Catholic University Bulletin,* January, 1914. Professor Ch. V. Langlois, however, made some strictures upon Mandonnet's general method of arriving at conclusions, in his review of the first edition of the *Siger de Brabant* in *Revue de Paris,* Sept. 1, 1900, p. 71.

[5] *Revue Néo-Scolastique,* XVII, 323-24.

Mandonnet declares that Charles "has given no evidence for his conclusion and could not do so," [1] but our detailed presentation of the opinions of the men named and of others will show that Charles was quite right and that Mandonnet is all wrong.

Mandonnet fails to prove Albert hostile to astrology.

Mandonnet, in fact, gives no sign of having ever candidly examined the works of Albert to see what his attitude towards astrology really was, so that it seems arrant presumption on his part to question Charles' statement. And he himself gives no justification for having questioned it. He cites only one passage directly from Albert's works, and it is merely a repetition of the argument of the saints that the star at Christ's birth was a miraculous apparition in the upper air rather than the sky.[2] Then he quotes three passages from the fifteenth century biography of Peter of Prussia as if they were Albert's own statements. If they are, why does not Mandonnet state where they are to be found in Albert's works? Also why does he not state that these passages occur in chapters where Peter is making an effort, none too successful or disingenuous, to defend Albert from the charge of having devoted too much attention to nigromancy and such arts rather than to mere astrology? Mandonnet does note that Peter believed Albert to be the author of the *Speculum astronomiae,* but he does *not* note that Peter in these very chapters which he cites relies chiefly on the *Speculum astronomiae* to clear Albert from the charge of dabbling in nigromancy. In brief, Peter proves from the *Speculum* that Albert did not favor nigromancy; then Mandonnet proves from Peter that Albert did not believe in astrology and so could not have written the *Speculum!* In succeeding chapters [3] Peter goes on to try to make out from the *Speculum* that Albert opposed astrological images and interrogations and that he was more cut-spoken against them than Aquinas. But this Mandonnet says nothing of, and it would not fit his argument.

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[1] *Revue Néo-Scolastique,* XVII (1910), 328.

[2] *Summa de Creaturis,* tract. III, q. 15, art. 2: *Opera omnia,* ed. Borgnet, t. 34, p. 434.

[3] Petrus de Prussia (1621), caps. 13-15, pp. 137-50.

The passages from Peter which Mandonnet does select as suited to his purpose are as follows:

> "The pursuits of magicians and necromancers are evil and superfluous and forbidden by the church. . . . That *mathematici* or idolaters sometimes predict the future is the outcome of conjecture and fatuous presumption, not of certitude. . . . There are three things to which some men have recourse, namely, sorcerers, enchanters, and *mathematici,* but which really are not wisdom but foolishness, for the Chaldeans rely on such methods. The *mathematici* seek to reduce the effects of the stars to fixed hours, and those who investigate such things are far from the one science of God." [1]

Even if these passages are from Albert's works, they are no proof that he condemned astrology. Roger Bacon penned very similar passages, and the *Speculum astronomiae* expresses no approval of either enchanters or sorcerers or magicians or *mathematici.* We have already repeatedly seen that *mathematici* was used in two senses and that one might condemn the *mathematici* as diviners and yet accept astrology. Albert himself made such a distinction in his *Commentary on Matthew* [2] where he differentiates between two, or rather three, kinds of mathematics. One is the abstract science in our present sense of the word; the other, more properly called *mathesis* and pronounced with a long middle syllable, is "divination by the stars," but it in turn may be either good or bad, superstitious or scientific. Thus it is proved by a direct examination of Albert's writings that, contrary to the impression which Mandonnet strives to give by his citation from Peter of Prussia, even in his theological works Albert did not condemn all *mathematici* even, to say nothing of astrology. And we have further seen that in his scientific writings he sometimes does not condemn even magic. We shall now proceed to show from numerous passages in other works than the *Speculum astronomiae* how favorably inclined toward astrology Albert really was.

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[1] Petrus de Prussia (1621), pp. 123, 131, 133; cited by Mandonnet (1910), p. 329, note 1.

[2] *In Matth.,* II, 1.

Nature of the heavens and the stars.

Albert accepts the Aristotelian description of the sky and heavenly bodies as formed of a fifth element distinct from the four elements of which earthly objects are composed.[1] In another passage he subdivides the heavenly substance into three elements composing respectively the sun, the moon and stars, and the sky apart from the celestial bodies.[2] In any case the stars are nobler than inferior bodies, "less involved in the shadows and privations of matter," and closer to the first cause of the universe.[3] Their motion is eternal, unchangeable, incorruptible.[4] Some have called them animals but Albert holds that they are not animals in the sense that we apply that word to inferior creatures.[5]

The First Cause and the spheres.

Again like Aristotle, Albert regards the heavens and stars as instruments of the first mover or intelligence, just as the hand is the instrument of the human intellect in making works of art.[6] They are mediums between the first cause and matter. Albert believes in a number of heavens "existing from the first heaven to the sphere of the moon." [7] The first mover moves the first heaven and through it the other spheres included within it. Whether every other heaven has its own celestial intelligence to move it is a question upon which Albert is somewhat obscure.[1] Others certainly thought so. He mentions, for instance, the opinion of certain Arabs that floods are due to the imagination of the intelligence which moves the sphere of the moon, and concedes that there is some truth in it.[2] The ancient Stoics and Epicureans, he tells us in another passage, ascribed divinity to the virtue of the circle of the zodiac, which ruled and governed life under the God of gods, as they called the First Cause. Apuleius in the *De deo Socratis* says that they called the twelve signs incorporeal gods, and the planets and other stars corporeal gods, and the chief effects of the celestial virtue upon inferior nature terrestrial gods.[3] But probably Albert mentions this merely as an illustration of the great influence exerted by the circle of the zodiac. In a third passage he says that the movers of the celestial spheres, whom the philosophers have called celestial intelligences, are mediate causes between the First Cause and matter; but he presently adds that philosophers of better understanding have said that there is only one Mover of everything, and that the so-called movers of the other spheres are but the virtues and members of the first heaven and its Mover.[4] Translated from terms of Aristotelian physics into those of Christian theology, this means that the stars are merely God's instruments, and that, if there are spirits or intelligences delegated to move the particular heavens, these angels are also merely God's agents.

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[1] *De causis et proprietatibus elementorum et planetarum,* I, i, 1.

[2] *Ibid.,* II, i, 1.

[3] Borgnet, X, 1–2.

[4] *De meteoris,* I, i, 4.

[5] *Metaphysicorum,* XI, ii, 12.

[6] *Idem.* "Sicut manus est instrumentum intellectus practici in artificialibus, ita totus coelestis circulus est instrumentum huius intellectus ad totam materiam naturae quae ambit." See also *Metaphysicorum,* V, ii, 4; *De intellectu et intelligibili,* I, 4, "Sic totus coeli concentus refertur ad causam primam"; *De animalibus,* XVI, i, 11, "Orbis autem revolvitur ab uno intellectu primo ad quem referuntur alii motores"; *Liber de natura et origine animae,* I, 5, "Intellectus qui est cum coelesti virtute, eo quod ipse coelum movet, et movet virtutes coelestes quae sunt in materia generabilium, et est intellectus purus et primus movens et informans omnia alia sub ipso instrumentaliter agentia."

[7] *De animalibus,* XX, ii, 2.

Things on earth ruled by the stars.

Since the celestial spheres and the stars are the instruments and mediums through which the First Cause governs the world of inferior creation, it follows that the four elements are generated by the motion of the heavens and that plants, stones, minerals, animals—in short, whatever exists in the inferior world is caused by the motion of the superior bodies. This general law that the world of nature and of life on this earth is governed by the movements of the stars is expressly repeated again and again in Albert's works, and its truth is assumed even oftener.[1] We may note by way of illustration a few of the specific applications of this general law to be found in Albert's writings. Arguing the question whether life is possible in the torrid zone at the equator, Albert points out that the rays of the stars are more multiplied there and fall perpendicularly and directly and therefore are even more favorable to the generation of life than in our climate.[2] In another passage he explains the pagan attribution of the thunderbolt to the god Jupiter as probably a mistake due to the influence of the planet Jupiter in provoking thunder-storms.[3] A third passage ascribes the height of the inundation of the Nile to the planets, stating that Venus and the Moon produce a greater overflow than other drier stars.[4]

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[1] *De causis et procreatione universi,* I, iv, 7, "Utrum coelum moveatur ab anima vel a natura vel ab intelligentia."

[2] *De causis et proprietatibus elementorum et planetarum,* I, ii, 9.

[3] *De animalibus,* XX, ii, 2.

[4] *De intellectu et intelligibili,* I, 4. "Mediae autem causae sunt motores orbium coelestium quos intelligentias coelestes vocaverunt Philosophi. . . . ideo melius intelligentes Philosophi totum unicum motorem dixerunt habere, et inferiores motores ad sphaeras dixerunt esse virtutes et membra primi coeli et sui motoris." Yet in *De coelo et mundo,* II, iii, 5, he asserts again that the stars "sunt instrumenta intellectuum moventium," as if there were more than one intelligence.

Conjunctions.

Albert has a good deal to say of the effects produced by the conjunctions of the planets,[5] ascribing to them great mortality and depopulation, or "great accidents and great prodigies and a general change of the state of the elements and of the world." [6] To a conjunction of Jupiter and Mars with others aiding in the sign of Gemini he attributes pestilential winds and corruption of the air resulting in a plague by which a multitude of men and beasts suddenly perish.[7]

Comets.

Albert also discusses comets, and why they signify wars and the death of kings and potentates rather than of some poor man.[8] Their especial connection with wars is explained by the astrologer Albumasar as due to their association with the planet Mars. As for kings, owing to their greater fame and power, the relation of celestial phenomena to their destinies has been observed more carefully than the fate of the poor, and as their horoscopes have more planetary dignity, so it is customary to refer greater portents to them.

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[1] See *De meteoris*, I, i, 4 and 7; *De causis et propriet. element.*, etc., I, ii, 2; *Mineralium*, II, iii, 3; *De causis et procreat. universi*, II, ii, 23.

[2] *De natura locorum*, I, 6.

[3] *Meteor.*, III, iii, 22.

[4] *De causis et propriet.*, I, ii, 2.

[5] *Idem.*

[6] *Ibid.*, I, ii, 9.

[7] *Ibid.* II, ii, 1.

[8] *Meteor.*, I, iii, 11.

Man and the stars.

Despite the allusion just made to royal horoscopes, Albert makes an exception to the control of the stars over this world in the case of man. Strictly speaking, however, this is no exception, since man is not to be classed with other inferiors inasmuch as his soul is a superior being, derived from the First Intelligence and still subject to Its illumination. "The essence of the soul is wholly and solely from the first cause." [1] It is true that Plato says that the soul receives something in each sphere or heaven, memory from the sphere of Saturn and so on; but Albert regards this doctrine as simply a description of the process of fitting the mind or soul to the body which it must occupy.

Free will.

But the human reason and will remain free and are not necessarily subjected to the movements of the stars. Thus in his theological *Summa* Albert admits that the stars govern even the souls, vegetable and sensitive, of plants and brutes, but denies that they coerce the loftier rational soul and will of man, who is made in the image of God, except as he yields to sin and the flesh.[2] But this last is a very important exception as we see from a passage in the treatise on minerals.[3] "There is in man a double spring of action, namely, nature and the will; and nature for its part is ruled by the stars, while the will is free; but unless it resists, it is swept along by nature and becomes mechanical (*induratur*)."

Ptolemy on free will.

Albert is aware that neither the Peripatetic philosophy nor the art of astrology itself slavishly subjects the human mind and will to the stars.[4] Rather he keeps citing Ptolemy to show that the astrologers themselves do not believe in fatal necessity and that consequently the art of astrology is not incompatible with Christianity.[1] Ptolemy declares that the mind apprehends the superior bodies in their spheres, and can freely turn away from those things towards which the motions of the stars incline it, and can turn towards other things by the wisdom of its intellect.[2] In another passage Ptolemy is quoted as saying that the effects of the stars can be impeded by the science of men skilled in astrology.[3] If the average "astronomer and augur and magician and interpreter of dreams and visions" has brought divination into disrepute, it is, says Albert in a third passage, because "almost all men of this class delight in deception and, being poorly educated, they think that what is merely contingent is necessary, and they predict that some event will certainly occur; and when it does not, those sciences are cheapened in the sight of unskilled men, although the defect is not in the science, but in those who abuse it. For this reason wise Ptolemy says that no judgment should be made except in general terms and with the cautious reservation that the stars act *per aliud et accidens* (subject to other forces and to accidents) and that their significations meet many impediments. Moreover, the pursuit of sciences dealing with the future would be idle, if one could not avoid what one foresaw." [4]

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[1] *De intellectu et intelligibili,* I, 4; also *De natura et origine animae,* I, 5, "Et ideo complementum ultimum quod est intellectualis formae et substantiae non per instrumentum neque ex materia sed per lucem suam influit intellectus primae causae purus et inmixtus."

[2] Pars prima, Quaest. 68.

[3] II, iii, 3.

[4] *De intell. et intell.,* I, 4. "Quod autem anima praecipue sub motibus astrorum restringitur contra omnes est Peripateticos et contra Ptolemaeum."

Nativities.

But free will no more restrains Albert than it did Ptolemy from accepting the art of genethlialogy [5] or casting of nativities, as his mention of royal horoscopes has already suggested. He states elsewhere that the astrologer who understands the virtues of the signs of the zodiac and of the stars situated in them at the moment of birth can prognosticate so far as lies within the influence of the sky concerning the entire life of the person born.[1] Indeed, Albert ascribed to Ptolemy a treatise *De accidentibus parvis particularibus*[2] concerning the events in the life of the individual born under this or that constellation, as contrasted with great social events involving large numbers of men such as political revolutions, racial migrations, and religious movements, of which Ptolemy is said by Albert to have treated in another work in eight parts called *De accidentibus magnis universalibus in mundo*.[3]

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[1] *De generatione et corruptione*, II, iii, 5.

[2] *Summa*, I, 68, *passim*.

[3] *De natura locorum*, I, 5.

[4] *De somno et vigilia*, III, ii, 5.

[5] I take it that *geomantici* should be *genethliaci* in the passage (*De coelo et mundo*, II, iii, 5) given in Borgnet's text as follows: "Et hoc oportet relinquere scientiae electorum, quia alio nomine vocantur geomantici eo quod principalius quod inquirunt per stellarum figuras et effectus sunt nativitates . . . et eventus nascentium. . . ."

Galen on the stars and human generation.

Albert even believed that the influence of the stars upon man was stronger in some respects than upon other animals. He attributed to Galen in the treatise *De spermate* a statement, which I have failed to find in Galen's *De semine* or other works, that "in the generation of brutes the sperm is not altered according to the order of the hours and the operations of the planets and signs as it is in man." Albert prefers his own explanation of this circumstance to that offered by Galen. It is that the human body is less material and terrestrial than those of the brutes and more nearly resembles the heavens, and so more readily follows the impressions from the sky, and is a sort of microcosm as a beast is not. On the other hand, Albert grants that changes of the atmosphere and weather are felt more quickly by the beasts, who have little else to distract their attention.[4]

Plato on boys and the stars.

Albert states that Plato, as well as Ptolemy and Galen, proved the influence of the stars upon human beings from the case of boys, who are still too young to make much use of free will against nature and the force of the heavens. For boys often display a special aptitude, due to celestial influence, for some one art and become perfect workmen if they are trained in it; but if they are forced into another occupation, never attain proficiency therein because of their natural ineptitude for it.[1] This is of course the same point as was illustrated in the pseudo-Aristotelian *Secret of Secrets* by the story of the weaver's son whose horoscope showed a predilection to govern, and the king's son whose sole interest was in the mechanical arts.

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[1] *De gener. et corrupt.*, II, iii, 5.

[2] *De coelo et mundo*, II, iii, 5.

[3] Albert was of course also familiar with the *Tetrabiblos* or *Quadripartite* of Ptolemy and with the *Centiloquium* ascribed to him. He names three commentators upon it, namely, the well-known Arabian and Jewish authorities, Haly and Abraham, and a mysterious third, Bugaforus (*Meteor.*, I, iii, 5).

[4] *De animalibus*, XXII, ii, 1. The closest approach to the passage that I have found in Galen occurs in the *De foetuum formatione* (Kühn, IV, 700-701) where Galen mentions approvingly the theory of some Platonic masters that the world-soul is responsible for the marvelous process of the formation of the foetus, but adds that he regards it as impious and unfitting to ascribe the generation or formation of scorpions, spiders, flies, fleas, worms, vipers, and the like to the soul of the cosmos.

The doctrine of elections.

Naturally Albert finds no difficulty in accepting the astrological doctrine of elections, by which the astrologer applies his knowledge of the movements and effects of the stars and their relationships to inferior bodies to the selection of a favorable hour for beginning a contemplated action.[2] This doctrine of course implies and requires freedom of election and will, and shows that astrology is an operative as well as divining art. In another passage Albert mentions the famous and historic, as he regards it, royal example of eugenics, when Nectanabus, the natural father of Alexander, in having intercourse with his mother Olympias observed the hour when the Sun was entering Leo and Saturn was in Taurus, since he wished his son to receive the figure and force of those planets.[3]

Influence of the stars on works of art.

If astrology is thus operative as well as divinatory by its power to select the proper and most advantageous moment for entering upon any course of action, and to harness so to speak the power of the planets, it becomes evident that it is or should be an all-important factor in all the arts. Albert well asserts therefore that a fundamental principle of this science is that all things which are made by nature or art are moved first by celestial virtues. He adds that no one doubts this concerning nature, and that it is also true of art, in which it is the influence of the stars which incites the artist to make something.[1] The force of the stars is potent in alchemy, for example,[2] for those who try to transmute metals and stones produce purer metals and stones when the moon is waxing and ascending, "and particularly the more skilful they are, not hurrying their operations, but awaiting the opportune time when the process is assisted by celestial virtue."

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[1] *Mineral.*, II, iii, 3.

[2] *De coelo et mundo*, II, iii, 5.

[3] *De animal.*, XXII, i, 3.

Astrological images.

Of all the arts the most astrological is that of images, to which Albert devotes several chapters of his treatise on minerals.[3] In it images of the stars are engraved on gems or metals at the favorable moment when the celestial force is strongest, "and marvels are worked by such images" because some force from the celestial figure flows into the work of art.[4] Incidentally Albert remarks that "in the science of geomancy" the figures traced from the points are of no value unless they can be made to conform to such astronomical images. Albert mentions several particular astronomical conditions which must be observed in engraving such images. Gems from India are the best for this purpose. Some images engraved in antiquity are no longer efficacious. Albert gives a number of examples of the effects expected from these images.[5] Stones engraved with Aries or Leo or Sagittarius are good for fevers, dropsy, and paralysis, and are said to make their possessors talented and fluent and highly honored. Stones carved with Gemini and Libra and Aquarius temper hot humors and promote friendship, justice, civility, and observance of law.

Discussion of fate in the *Summa theologiae.*

In the foregoing sketch of Albert's attitude to astrology, based chiefly on his writings in the field of natural science, some allusion has also been made to his discussion of the subject in his *Summa* of theology, which occurs in the section *On fate,*[1] "which those maintain who deny providence" and which is generally identified with the influence of the stars. I have in the main, however, reserved this section for separate treatment here, partly because it might be expected to show a more conservative and less favorable attitude to astrology than Albert's scientific writings, since its authorities would presumably be the church fathers, while the scientific works reflect the views of Aristotle and other Greeks and Arabs. And partly for another reason, that I am inclined to question whether a supplementary passage at the close of this section is by Albert or added by another hand.

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[1] *Mineral.,* II, iii, 3. "Est autem principium in ipsa scientia omnia quaecunque fiunt a natura vel arte moveri a virtutibus coelestibus primo; et hic de natura non est dubium. In arte etiam constat, eo quod aliquid modo et non ante incitat cor hominum ad faciendum; et hoc esse non potest nisi virtus coelestis, ut dicunt sapientes praenominati." Then follows immediately an admission of the freedom of the human will which has already been cited.

[2] *De causis et propriet, element. et planet.,* I, ii, 7.

[3] Liber II, Tractatus iii.

[4] II, iii, 3.

[5] II, iii, 5.

Attempt to reconcile the fathers with the astronomers.

Although Albert in this section of the *Summa* approaches the subject of the influence of the stars from the unfavorable standpoint of fate instead of the favoring one of nature, it is noteworthy that he is not content merely to reproduce the attacks upon astrologers by Augustine and Gregory of Nyssa, but endeavors to reconcile them with the views of such scientific or pseudo-scientific authorities as Ptolemy, Hermes Trismegistus, "Socrates," and other *Astronomi.* The keynote of his solution is found in the definition of Boethius that "Fate is the disposition inherent in movable things by which Providence binds each by its order." Thus there is no necessary conflict between Providence and the rule of the stars. But Albert maintains that "neither fate nor stars nor even Providence takes away from human free will its liberty of action," [2] quoting Ptolemy as usual to the effect that the wise man rules the stars and that what the stars do they do *per aliud et accidens.* Albert therefore rejects absolute fatal necessity as heretical [3] and the doctrine of the *magnus annus* that history repeats itself as the stars repeat their courses as "horrible." [4] On the other hand, he insists that "it cannot be denied that the stars by the figures of their positions pour radiations of diverse figures upon the place of generation,"[1] or that "the stars in truth are rulers of the world in those things which are subject to the world,"[2] namely, things corporeal. He also admits that the soul may be inclined to the body, though not coerced. Thus a choleric person is likely to choose different food and occupation from a phlegmatic one. Hence Socrates "says that voluntary elections are made in accordance with the diversity of habits previously existing in the chooser."[3] But Socrates means that such habits incline but do not compel us. Later Albert qualifies Gregory of Nyssa's assertion that our choosing precedes "fortune" by again pointing out that the influence of the stars "inclines the will to choose this or that."[4]

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[1] *Summa,* Pars prima, Quaestio 68, *De fato;* in Borgnet, vol. 31, pp. 694-714.

[2] *Ibid.,* p. 701.

[3] P. 696, "Unde sic dicere fatum, est haereticum."

[4] P. 708.

Glossing over Augustine.

Albert has to force his authorities a good deal to arrive at this compromise. Thus he interprets Augustine's grudging concession that it "can be said not utterly absurdly that certain sidereal afflations effect mere differences of bodies, as we see that the seasons of the year vary with the approach and withdrawal of the sun and some sorts of things, such as shellfish and the wonderful tides of ocean, increase and diminish with the waxing and waning of the moon,"—Albert interprets this as favoring his own much more sweeping assertion that the stars rule the universe in most respects and change the souls as well as the bodies of plants and brutes.[5] Again, Augustine, asking "What is so pertinent to the body as sex?" contended against the astrologers that twins of opposite sex might be born under the same constellation; yet Albert maintains that Augustine did not mean here that sex of the body is not subject to the stars, but only that the constellations are not the sole and entire cause of natural bodily processes, and this for the reasons given above from Ptolemy, namely, that the influence of the stars depends upon the capacity of matter to receive it and operates *per aliud et accidens*.[6]

Christ and the stars.

In connection with the question, "Whether Christ was subject soul and body to fate or fortune or *eupraxia?*" Albert makes an exception to the influence of the stars, and apparently holds that even in respect to His body Christ was not subject to the power of the constellations. The argument is advanced that the Lawgiver is not subject to the law. The opposing contentions that in becoming man Christ assumed the defects of our mortality and that, since fate is the disposition inherent in all mobile objects, Christ was subject to fate as much as any other man,—these are denied on the ground that Christ became man voluntarily and suffered as man only what and when He would, and that from the moment of conception He possessed "grace and all knowledge." It is also held that when the Magi said that they had seen His star in the east, they did not mean a constellation ruling His nativity but a new celestial sign which demonstrated the new birth of a heavenly king.[1]

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[1] P. 698.

[2] P. 701.

[3] Pp. 698 and 702.

[4] Pp. 706 and 710.

[5] P. 696.

[6] Pp. 702, 704.

Patristic arguments against astrology upheld, but perhaps not by Albert.

Scarcely consistent with the apparent approval with which Albert cited the views of the "astronomers" and such a work as the *Tetrabiblos* or *Quadripartitum* of Ptolemy in the preceding discussion, and with the general tone of much of it, seems a supplementary passage at the close of this section on fate[2] after he has apparently completed the discussion of the four questions concerning fate which he put at the start. In this supplementary passage are upheld against the "calumnies" of the astrologers such objections of Augustine and Gregory the Great to the art of nativities[3] as that Jacob and Esau were conceived and born under the same constellation, that a queen and slave may be conceived at the same instant, and that there are countries where no one born under Aquarius becomes a fisherman or under the Balances a money-changer. The argument employed in this connection, which we cannot follow in detail, involves such a dubious piece of physics as that the pyramid of light which gradually spreads from a distant luminous point exercises the same force on all points lying within its base. The astronomers would doubtless retort that the rays of light falling perpendicularly and the shortest distance would be stronger and more efficacious than the oblique ones, or that pyramids must also be taken into account with the point in the object affected and the base in the constellation. Indeed, Albert in this very section *On fate* has previously shown [1] from the science of perspective and *Liber de speculis* that in Ethiopia the sun's direct ray "reflected upon itself" produces fire and makes the child born there fiery and black, while near the pole the great obliquity of the incidences of the rays produces cold and damp. For such reasons as these I am inclined to wonder if this supplementary passage, which is not essential to the plan or main argument of the section *On fate,* has not been added by someone other than Albert. Whoever the author is, he also agrees with Augustine that, when asked to account for two persons falling sick, growing worse, and recovering at the same times, Hippocrates gave the better answer in saying that they were conceived and born together of the same parents, than Posidonius did in saying that they were born under the same constellation. For Hippocrates named the immediate cause, whereas Posidonius mentioned the extrinsic and indirect one, for the stars are not a cause, it is again reiterated, except *per aliud et accidens.* But the author, like Albert before, holds that Augustine does not deny that there is some force from the stars inclining though not compelling us. This is equivalent to sanctioning astrology.

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[1] Pp. 707, 711.

[2] Pp. 711-4.

[3] Albert, of course, has already upheld free will against the doctrine of fatal necessity in nativities; it is therefore only the support of these particular arguments of Augustine and Gregory that seems strange.

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[1] P. 698.

CHAPTER LX

THOMAS AQUINAS

Bibliographical note—Precociousness of Aquinas—Early life according to Thomas of Cantimpré—Is Thomas of Cantimpré reliable?—Ptolemy of Lucca on Aquinas' early life—Date and place of his studies with Albert—His closing years—His success as a theologian—His commentaries on Aristotle—The spheres of theology and science—Aquinas as a scientist—Inferior to Albert—His theological approach to the subject of magic—Miracle distinguished—Reality of magic affirmed—Magic not a science but due to demons—And is evil—But some regard magic as a human art or science—Aquinas' belief in witchcraft—Divination—Lot casting—Occult virtues—Alchemy and fascination—Amulets and incantations—Attitude to astrology—Extent of and limits to the influence of the stars on man—Power of astrological images denied—The Magi and the star—Is *De fato* spurious?—Fate and the stars—Contradictions between *De fato* and other works of Aquinas.

Precociousness of Aquinas.

THOMAS AQUINAS was perhaps not so precocious a genius as some of his fellow-countrymen who were artists during the Italian Renaissance. But if he did not die quite as young as Masaccio or Raphael, he nevertheless produced a vast amount of learned writing within a comparatively short time.

Bibliographical Note. A critical biography of Aquinas has not yet appeared. D. Prümmer began in 1911 to publish the sources, when he edited the hitherto unprinted biography by Peter Calo who wrote about 1300: *Fontes Vitae S. Thomae Aquinatis notis historicis et criticis illustrati,* Fasc. I, Toulouse, 1911. Peter Calo seems to have admitted a great deal of legendary material. D. J. Kennedy's "Thomas Aquinas" in CE profits by this publication and contains perhaps as good a brief sketch of Aquinas' career as there is in English. It also has a good bibliography. It is, however, at variance on some points with Thomas of Cantimpré's statements, as I have indicated in the text.

On the bibliography of Aquinas' own works one may consult: C. U. J. Chevalier, *Catalogue critique des œuvres de Saint Thomas d'Aquin,* 1887; A. Miola, *Codices MSS operum S. Thomae de Aquino et S. Bonaventurae in Regia Neapolitana Bibliotheca,* 1874; P. Mandonnet, *Des Écrits Authentiques de S. Thomas d'Aquin,* Fribourg, 1910. Latest and fullest, but still leaving much to be desired despite its 252 pages, is A. Michelitsch, *Thomasschriften,* 1913, vol. I; which gives the sources for Aquinas' biography

Whether we believe that he was born in 1225 or 1227, he was not yet fifty when he died on the seventh of March, 1274. Ptolemy of Lucca, who states that he had often heard Aquinas' confession and had attended his lectures and been his friend for a long time,[1] says that Thomas became a Dominican at sixteen and "lived in pure innocence" for about thirty-two years thereafter.[2] A passage in the *Compendium studii philosophiae* of Roger Bacon sneers at the theological teaching of "the boys of the two Orders, such as Albert and Thomas and the others who enter the Orders when twenty

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but too briefly with arbitrary omissions, the bare numbers of MSS containing his works without indication of their date or contents, the old lists of his writings, and a full analysis of the printed editions. Fossi (1793-1795) II, 663-98, lists such of Aquinas' works printed before 1500 as are in the Magliabechian library at Florence.

Since the edition of the works of Aquinas begun by order of Pope Leo XIII at Rome, 1886-1906, has never been completed, the most useful edition and that which I have employed remains that by E. Fretté and P. Maré, *Opera omnia*, Paris, 1871-1880, in 34 volumes.

I have not been much impressed by the worth of such secondary works on Aquinas and his science as I have happened upon: for some bibliography see Paetow (1917), pp. 406, 408-9. Paetow does not mention A. Farges, *Études philosophiques pour vulgariser les théories d'Aristote et de S. Thomas et montrer leur accord avec les sciences*, 1909; A. Fisichella, *S. Tommaso d'Aquino, Leone XIII e la scienza*, 1880; T. Gaudenzi, *S. Tommaso d'Aquino e la scienza*, 1874; Frohschammer, *Die Philosophie des Thomas von Aquino*, Leipzig, 1889; nor G. M. Cornoldi (1822-1892), *The Physical System of St. Thomas*, English translation by E. H. Dering, London, 1893. The last is a Roman Catholic defense of the natural philosophy of Aquinas against modern science, which obscures the facts that Thomas held fast to the theory of four elements and derived his natural philosophy from Aristotle. Overworked as the words "camouflage" and "propaganda" are, one is tempted to apply them in the case of recent Aquinas literature. At the same time it is remarkable how few libraries have a complete and unexpurgated edition of his works. I have not seen F. Tessen-Wesierski, *Die Grundlagen des Wunderbegriffes nach Thomas von Aquino*, 1899, in *Jahrb. f. Philos. u. Spekulative Theologie*.

The relation of Aquinas to Dante has been the theme of more than one work; an example is N. Busetto, *Saggi di varia Psicologia Dantesca contribute allo studio delle relazioni di Dante con Alberto Magno e con San Tommaso*, 1905.

[1] Ptolemy of Lucca, *Hist. Eccles.*, XXIII, 7 (*Muratori*, XI, 1169), recounting the death of Aquinas remarks, "Unde cum multa devotione et mentis puritate et corporis qua semper floruit et in Ordine viguit, quemque ego probavi inter homines quos umquam novi qui suam saepe confessionem audivi et cum ipso multo tempore conversatus sum familiari ministerio ac ipsius auditor fui, ex hac luce transiit ad Christum. . . ."

[2] *Ibid.*, XXII, 20 (*Muratori*, XI, 1152).

years or under.[1] Perhaps the names of Albert and Thomas were not in the passage as originally penned by Bacon; Albert at least had probably come of age before the friar orders started, and Bacon would scarcely look back upon a man who was his senior as a boy. But the fact remains that Thomas at least became a Dominican at an early age.

Early life according to Thomas of Cantimpré.

Thomas of Cantimpré tells[2] how Aquinas entered the Dominican order at Bologna against the wishes of his family—he was the son of the count of Aquino and the countess of Teano—who secured a summons to the papal court where he was ordered to put off the friar's dress and be invested with ecclesiastical office. When he refused, his two brothers secretly seized him and shut him up in prison where he suffered from want, cold, and poverty, and further from women whom his brothers introduced to tempt him. He remained thus imprisoned "for two or three years" according to Thomas of Cantimpré, until master John of the Dominicans complained to the emperor Frederick II who secured Aquinas' release and would, according to Thomas of Cantimpré, have put his brothers to death for their inhumanity but for master John's further intervention. Master John then shipped Aquinas off to Paris, but his brothers and friends at the papal court had him again summoned thither, and he was offered the post of abbot of Monte Cassino "under whom are seven bishops and who himself exercises the pontifical office." The pope was ready to allow him to continue to wear the Dominican costume in this position, but Aquinas fled a second time from the papal court and came to Cologne and studied there until Albert was transferred to Paris and given the chair of theology there for his incomparable learning. "After whom," continues Cantimpré, "also this same brother Thomas gained a position and chair of similar importance." The meaning of this last sentence is somewhat doubtful. Is "after" used in the sense of time or of precedence in dignity? Did Aquinas hold a position at the same time with and second only to Albert, or did he obtain the chair only after Albert had ceased to hold it? Chronological considerations make the latter more probable. But was the chair in question at Cologne or at Paris?

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[1] Brewer (1859), p. 426.

[2] *Bonum universale de apibus,* I, 20, xi.

Is Thomas of Cantimpré's account reliable?

This passage from Thomas of Cantimpré is at variance on a number of points with the accounts usually given of Aquinas' life. For instance, it makes him join the Dominicans at Bologna, not at Naples, and represents the pope as siding with his family in their efforts to keep Aquinas out of the Dominican Order instead of delivering Aquinas from the persecution of his family. But Thomas of Cantimpré apparently penned his passage during Aquinas' lifetime and it is probably a half century nearer the events than the *Lives* of Aquinas written in the early fourteenth century and upon which most modern accounts are based. At the same time it must be admitted that Cantimpré seems to write in a loose and exaggerated manner which does not command much confidence. But I suspect that he is the ultimate source of most of the later accounts covering the same ground.

Ptolemy of Lucca on his early life.

Ptolemy of Lucca, who may be regarded as an independent witness in view of his personal friendship with Aquinas, states that Thomas was of noble origin and descended from great counts of the kingdom of Apulia, that his family were faithful to the pope against the emperor Frederick II, and that Thomas was educated as a boy in the monastery of Monte Cassino. When he joined the Dominicans at sixteen, his relations kidnapped him, but he escaped to Rome and from there went off to Cologne to become Albert's pupil. At the age of twenty-five he came to Paris where before his thirtieth year he lectured on the *Sentences* and received his degree in theology. Before receiving the degree he had written a commentary on the *Sentences* and a treatise against William of St. Amour. As William of St. Amour was not condemned by the pope until October, 1256, and as the friars were not admitted to the doctorate in theology at Paris until 1257 or 1258, Ptolemy's statements would indicate that Thomas was not born until 1227.

Date and place of his studies with Albert.

On the other hand, the assertions of both Cantimpré and Ptolemy of Lucca that Aquinas studied with Albert at Cologne before Albert was called to Paris, do not fit in any too well with the usual dating of Albert's Paris residence as from 1245 to 1248, when he is again supposed to have returned to Cologne. Consequently Peter of Prussia in his fifteenth century life of Albertus Magnus held that Aquinas spent two periods of study with Albert at Cologne, one before and the other after Albert's teaching at Paris.[1] Similarly von Hertling[2] gives 1245-1252 as the duration of Aquinas' studies with Albert, after which he returned to Paris alone.

His closing years.

Only sixteen or seventeen years of life remained to Aquinas after he received his degree in theology. Ptolemy of Lucca states that he remained in Paris for only three years after receiving the degree, when he returned to Italy, where during the pontificates of Urban IV (1261-1264) and Clement IV (1265-1268) he resided at Viterbo, Orvieto, and Rome, and was offered but declined the archbishopric of Naples. During these same years Ptolemy places most of his chief works. In 1268 or 1269 he returned to Paris, but died in Italy in 1274.

His success as a theologian.

Aquinas rapidly attained great success as a teacher and authority as a theologian during his lifetime and seems still to be regarded as the greatest and most authoritative of the orthodox medieval theologians. This success was probably due to the fact that he did just a little better than anyone else what a great many had been and were trying to do, and that was to combine all previous Christian thinking into one systematic and consistent and moderate whole. Aquinas was probably not the most brilliant or original mind of his generation, but probably his teaching and writing were clearer to a greater number of students, and seemed sounder to a greater number of the thinkers of the time than the lectures or books of any other contemporary. He put matters clearly, concisely, moderately, and convincingly; and struck the golden mean as it were. We can see how he may have profited immensely by the work of predecessors like William of Auvergne and Albertus Magnus, and yet how his works would tend to supplant theirs. Moreover, the task at which he had been working was not one which admitted of infinite improvement. It was largely a problem of combining, classifying, reconciling, and presenting the views of previous generations and periods, and when this was once well done, there was no need of doing it again. The attitude therefore of Aquinas toward magic and witchcraft, astrology and divination, and other occult arts and sciences, and also toward natural science is quite important for us to note, since he summed up previous Christian thought so satisfactorily, since he was both the most popular and the most moderate teacher of his own time, and since his opinions upon these subjects remained for centuries acceptable and authoritative to the Roman Catholic Church.[1] At the same time for these very reasons we must not expect to find him putting forward any new and unusual views upon these points.

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[1] Peter of Prussia (1621), pp. 90-104.

[2] v. Hertling (1914), p. 9, note, where, however, he says, "Albert's Lehrtätigkeit an der Universität Paris schloss sich unmittelbar an jene von Strassburg," which leaves no time for Aquinas to come to Albert in the first instance at Cologne.

His commentaries on Aristotle.

Aquinas was not merely a theologian in a narrow and restricted sense of that word, but was also noted as a commentator on Aristotle.[2] Ptolemy of Lucca tells us that "he expounded practically all philosophy, whether moral or natural, but especially ethics and mathematics." These lectures, however, were not all published. Thomas did not comment on as many of the Aristotelian works as Albert did, and several of his commentaries were left unfinished and were completed by others such as Peter of Auvergne. Thomas has sometimes been given credit for bringing about and using as the basis of his commentaries a new translation of Aristotle, made directly from the Greek and presumably executed by William of Moerbeke,[1] although, as we have already noted in the case of Peter of Prussia's *Life of Albertus Magnus,* some say by Thomas of Cantimpré. It is true that William of Moerbeke translated some of the works of Aristotle, but I cannot find that anyone has ever identified a signed translation by him with the text used by Aquinas or otherwise adequately demonstrated that they worked in concert.[2] Even if Aquinas instigated William's translations

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[1] Some measure of Aquinas' hold upon the later middle ages may be had from the list of his works printed before 1500 and contained in the Magliabechian library at Florence: F. Fossi, *Catalogus codicum saeculo XV impressorum qui in publica Bibliotheca Magliabechiana Florentiae adservantur,* 1793-1795, II, 663-98.

[2] I have not had access to M. Grabmann, *Les Commentaires de Saint Thomas d'Aquin sur les ouvrages d'Aristote,* in *Annales de l'Institut Supérieur de Philosophie,* Louvain, III (1914), 229-82, nor to R. Simiterre, *Sur les condemnations d'Aristote et de Saint Thomas d'Aquin au XIIIe siècle,* in *Revue pratique d'Apologétique,* V (1907), 502-15.

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[1] Thus Rashdall, *The Universities of Europe in the Middle Ages,* 1895, I, 361, says, "Thomas Aquinas endeavored to procure better translations from the original Greek, and his efforts were seconded by Pope Urban IV. Special translations or special revisions of the existing Graeco-Latin translations were prepared for his use by a Dominican Friar of Greek birth, variously known as Wilhelmus de Brabantia or Wilhelmus de Moerbeka. To him at least the common tradition of the Middle Ages ascribes the *translatio nova* of the books of Natural and Moral Philosophy, which, in spite of many imperfections, held its place in the schools as a kind of authorized version of Aristotle till the dawn of the New Learning." Citing Jourdain, *Recherches,* p. 67, *et seq.;* Denifle, *Archiv,* II, 226-7. William the Fleming, as he is also called, was scarcely of Greek birth, but of course finally became archbishop of Corinth.

[2] In the 14th century bibliography of writings by Dominicans, Denifle (1886), p. 237, it is stated that William of Brabant, archbishop of Corinth (he became so in 1277 after Aquinas' death), "translated all the books of natural and moral philosophy from Greek into Latin at the instance of brother Thomas." But of the numerous signed translations by William extant very few are of works by Aristotle. Moreover, is the Thomas here mentioned Aquinas? The very next name in the bibliography in question to follow this Wilhelmus Brabantinus is Thomas Brabantinus or Thomas of Cantimpré, who may have been the person to suggest the translation to his fellow Fleming. However, Aquinas and William were both connected with the popes in Italy in the 1260's, and Aquinas would seem to have had more interest in a translation of Aristotle than Albert's other "auditor," Thomas of Cantimpré.

The following extracts from medieval chronicles specifically mention Aquinas, but as their dates are obviously incorrect not much reliance is to be placed upon them.

In Chronico Slavicorum apud Lindenbrogium ad annum 1249. "Wilhelmus de Brabantia Ordinis Praedicatorum transtulit omnes libros Aristotelis de graeco in Latinum verbum a verbo (qua translatione scholares adhuc hodierna die utuntur in scholis) ad instantiam sancti Thomae de Aquino Doctoris."

In Chronico Susati, quod MS servat Veneta SS. Ioannis et Pauli bibliotheca. "Anno Domini 1267 fr. Wilhelmus Brabantinus, corinthiensis de Ordine fratrum Praedicatorum, rebus excessit humanis, baccalarius in theologia. Hic from Aristotle, he could not have taken full advantage of them, since some of William's work of translation was executed after Aquinas' death.[1]

The spheres of theology and science.

We must not think of Aquinas' studies in secular philosophy and science as simply aimed to render these subjects serviceable and innocuous to Christian theology. He was too much a student of Albertus Magnus for that, and his study of Greek thought and natural science broadened his outlook beyond that of theology in a narrow sense. He believed, moreover, that to a large extent the fields of theology and natural science were distinct; that pure theologians should not try to settle purely philosophical or scientific problems, of which they knew little. Christians who deny as contrary to their faith the philosophical solutions of problems which are really indifferent so far as the Faith is concerned, simply bring Christianity, in Aquinas' opinion, into disrepute among the wise men of this world.[2] Conversely every theory of an ancient philosopher or hypothesis of science is not to be accepted as of equal rank with religious dogmas. When

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transtulit omnes libros Aristotelis Rationalis Naturalis et Moralis Philosophiae et Metaphysicae de graeco in latinum, verbum a verbo, quibus nunc utimur in scholis ad instantiam sancti Thomae de Aquino. Nam temporibus domini Alberti translatione vetere omnes communiter utebantur." "Albert's day" was of course no different from Aquinas' whom he outlived by six years.

In 1847 the *Histoire Littéraire*, XXI, 147, said, "Guillaume de Meerbeke passe pour avoir traduit tous les livres d'Aristote, à la prière de saint Thomas. Nous n'oserions affirmer ni cette intervention du docteur angélique, ni cette immensité des travaux du traducteur brabançon. Il s'en faut qu'on ait de lui une série si volumineuse de versions latines."

[1] As has been pointed out by HL XXI, 147, in the case of the "new translation" of the Ethics, dated in the colophon in 1282, whereas Aquinas died in 1274. Quetif and Echard (1719), I, 390, had argued, however, that this date was when the MS was copied and not when the translation was made; but this is far-fetched as most of William's translations are similarly dated. Certainly William's labors as a translator did not cease with his elevation to the archbishopric of Corinth, since he translated Galen *De alimentis* in 1277 and works by Proclus in 1281.

Quetif and Echard, in order to maintain the cooperation supposed to exist between William and Aquinas, also hold that William's translation of the *Elementatio theologica* of Proclus made at Viterbo in 1268 was from the Arabic and not from the Greek, since Aquinas says in his commentary on that work that the Greek text had not yet been found. This conclusion is also drawn by HL XXI, 148.

[2] See Duhem II (1914), 394, for a like opinion expressed by Augustine.

John of Vercelli submitted a list of questions upon which he desired, first, the opinions of the saints, and secondly, the opinion of Aquinas himself, Thomas protested at the start that some of the inquiries had nothing to do with the Christian faith but were purely physical.[1]

Aquinas as a scientist.

Furthermore we must keep in mind that Aquinas was something of a scientist himself. It is interesting to note that after his death the University of Paris wrote to the general chapter of the Dominicans, not only lamenting his death as an irreparable loss and asking that his bones might be sent to Paris for burial, but also requesting the transmission of certain books begun by him while at the university and not as yet completed upon his departure from Paris.[2] What were these writings: theological treatises, commentaries on the minor prophets, or manuals of devotion? None of these. They were a commentary on the philosopher Simplicius, another on the *De coelo et mundo* of Aristotle,[3] a third on the *Timaeus* of Plato, and finally a work on irrigation and mechanical engineering.[4]

Inferior to Albert.

Thomas, however, did no such important work in natural science as Albert. His commentaries upon Aristotle follow the text closely and do little more than expound it; they are not full of long digressions and additions, as Albert's are.

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[1] *Opera*, 27, 248.

[2] *Chartularium univ. Paris.* (1889-1891), I, 504-5, dated May 2, 1274, ". . . humiliter supplicamus ut cum quaedam scripta ad phylosophiam spectantia, Parisius inchoata ab eo, quae in suo recessu reliquerit imperfecta, et ipsum credamus, ubi translatus fuerit, complevisse, nobis benevolentia vestra cito communicari procuret, et specialiter super librum Simplicii, super librum de celo et mundo; et expositionem Tymei Platonis, ac librum de aquarum conductibus et ingeniis erigendis; de quibus nobis mittendis speciali promissione fecerat mentionem."

[3] Of this commentary the third and fourth books were finished by Peter of Auvergne.

[4] Aquinas is even credited with an abridgement of the Almagest in CLM 56, 1436 A. D., "Almagesti abbreviatum per magistrum Thomam de Aquino"; cited by Björnbo (1911), p. 129. But this, I take it, is the same as the abridgement of the Almagest which Averroes is said to have made and which was translated by the order of Alfonso the Great: see Digby 236, 14th century, fol. 190, where the writer of a prologue to another work of Averroes remarks, "Scivit enim Averoys optime Almagestum. Nam vidi per eum Almagesti abbreviatum, quem librum fecit transferri Rex Alfonsus Magnus, et habetur Bononie et in Hispania."

Thomas did not found an experimental school and had not himself devoted the long years of personal experience and observation to nature that his master had. And he seems to have had the less original and observant mind of the two. But his wide reading, his clear thinking, his well-ordered class-room presentation of material and arguments, and his broad yet moderate views insured his instant and permanent success in the field of theology, where the paths were already well trod, and it only remained for someone to put everything into as perfect and final a form as possible. In natural science, on the other hand, the labor that awaited men was not merely the lucid combination of Aristotelian and Arabic thinking with previous Christian thought, but the pioneer work of personal observation and experiment and the far more difficult combination of these with existing theories. Aquinas was a perfecter according to the standards of his own age; Albert sometimes was a pioneer in the spirit of the new age of science.

Aquinas' theological approach to the subject of magic.

In view of this distinction between the two men it is perhaps not surprising that what Aquinas has to say concerning magic, even in the broad use of that term, occurs to a large extent in his theological writings. Just as, although Albert was a distinguished theologian, we viewed magic in his works largely as connected with science; so, although Aquinas studied and wrote of secular philosophy and science, we find in him a moderate, enlightened, and highly influential statement of the attitude of Christian theological scholarship towards magic, witchcraft, and astrology. In his account of magic so-called in his *Summa, Contra Gentiles,* and *De potentia,* he seems to follow Augustine a good deal, and like him he makes considerable use of Porphyry's *Letter to Anebo.* Aquinas accepts the essential features of the previous theological definition of magic, as Albert did in his *theological* treatises.

Aquinas carefully distinguishes magic from miracle.[1] A

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[1] *Summa,* Prima pars, Quaest. 110, Art. 4, and Quaest. 111, Art. 3; *Contra Gentiles,* III, 101-3; *De potentia,* VI, 5; *Sententiae,* II, Dist. 7, Quaest. 2-3.

Miracle distinguished.

miracle is contrary to the order of all created nature and can be performed by God alone. Many things that seem marvelous to us or of which the cause is hidden from us are not, strictly speaking, miraculous. An eclipse seems a miracle to some ignorant people, but not to a philosopher who understands its cause. Other seeming marvels which are not divine miracles are the occult virtues of physical bodies "for which a reason cannot be assigned by man," [1] and the effects produced in our lower world by the influence of the constellations. Even more difficult of human comprehension are the doings of demons, who, Aquinas is convinced, can not only deceive the senses and affect the human imagination, but also truly transform bodies. Yet even their feats are not true miracles in violation of natural order; they simply add to the marvelous virtues of physical objects and the potent influences of the stars something of their own peculiar powers. After all, their feats can be explained, they operate by means of art; God alone is a cause absolutely hidden from every man.

Reality of magic affirmed.

As for magicians, in their feats they make use of herbs and other physical bodies; of words, usually in the form of "invocations, supplications, and adjurations"; they also employ figures and characters, sacrifices and prostrations, images and rites, carefully observed times, constellations, and other considerations.[2] As a result the whereabouts of stolen objects is disclosed, hidden treasure is found, the future is revealed, closed doors mysteriously open, men become invisible, inanimate bodies move and speak, apparitions of rational beings are summoned and answer questions. Some contend that such apparitions are imaginary, but Aquinas replies that on such occasions third parties have been present whose senses were working normally and who also witnessed the apparitions, and furthermore that no phantom of our imagination could reveal things of which we ourselves were ignorant. In the reality of such feats of magic, then, Thomas firmly believes.

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[1] *Summa,* Secundae secunda, Quaest. 96, Art. 2. *De potentia,* VI, 10; *Summa,* Prima pars, Quaest. 115, Art. 5;

[2] *Contra Gentiles,* III, 101-5; *De substantiis separatis,* cap. 2.

Magic not a science but due to demons.

But Aquinas will not admit that the magician and his materials are a sufficient cause of the magic. He also denies that certain men are especially endowed with magic power by the stars at their birth or that the influence of the constellations can be controlled to perform particular feats of magic. Demons in his opinion really perform the magic. Words, figures, spells are mere signs to them; the poor magician is their dupe. It looks, Thomas admits, as if spirits came only when invoked, and as if they often came unwillingly, and sometimes performed good deeds at the magician's bidding which must be very distasteful to them as evil beings. But in all this they are simply deceiving mankind. "It is not true then," says Aquinas, "that the magic arts are sciences, but rather they are certain fallacies of the demons."[1] In discussing the "notory art," which professes to acquire knowledge by fasting, prayers to God, figures, and strange words, he declares that demons cannot illuminate the intellect, although they may express in words some smattering of the sciences.[2]

And is evil.

Aquinas further charges that the practitioners of magic are generally criminals, perpetrating illicit deeds, adulteries, thefts, and homicides, a fact which has gained for magicians the further name of evil-doers, i. e. *malefici* (sorcerers). At best magic does not aid man in science or virtue, but in trivial matters such as the discovery of stolen goods.[3] Aquinas repeats the criticism of Porphyry in *The Letter to Anebo* that the methods of magic are immoral. Therefore it is wrong to seek to learn "the magic sciences" in order to use them, but permissible to study them in order to confute them. Aquinas then makes haste to correct this phrase "magic sciences," as we have already noted above.

Some regard magic as a human art or science.

But by his own denial Aquinas makes it sufficiently evident that many men of his time thought the magic arts

[1] *Quodlibet,* IV, 16.

[2] *Summa,* Secundae secunda, Quest. 96, Art. 1.

[3] *Contra Gentiles,* III, 106.

sciences, and that magicians believed themselves able by personal qualifications, by subtle use of occult natural properties, by rites and ceremonies, and by the art of astrology, either to work wonders directly and immediately or to coerce demons to work wonders for them.

Aquinas believes in witchcraft.

In lending the authority of his name to an affirmation of the reality of demon-magic, Aquinas must share together with many writers before and after him responsibility for the witchcraft delusion and executions. And yet he tells us that there were already some persons by his time who denied that there was any such thing as witchcraft except in men's imaginations and fears. Such persons argued that where the supposed sorcery was not entirely due to imaginary terror, it could be explained as the natural effect of occult causes. But Aquinas, who twice argues the question whether the consummation of marriage can be prevented by sorcery,[1] declares that the authority of the saints and of the Catholic faith alike proclaim the reality of witchcraft and its power to obstruct carnal union. Men who dispute this are the same as denying the existence of the demons.[2] Dear demons! What a treasured legacy of theology from paganism!

Divination.

Aquinas also tends to follow ecclesiastical tradition in condemning most arts of divination as the work of demons,[3] and in carefully distinguishing from them divine prophecy, which can speak with certainty even of contingent matters.[4] He grants, however, that some arts of divination have a natural basis, and that natural divination is permissible, if not extended to accidental occurrences and to human acts due to the reason and will.[5] It is possible to forecast the future by interpretation of dreams which are produced by natural causes either within or outside the sleeper's body.[6] The commentary of Aquinas on Aristotle's *De somno et vigilia* is, however, a perfunctory treatise, inferior to that by Albertus Magnus on the same theme, and advances no ideas of Thomas' own on the subject of divination from dreams. Even augury may be natural divination, if the acts of the animals under observation are governed by the positions and movements of the stars.[1] Aquinas also mentions chiromancy without disapproval, but will not admit that geomancy comes under the head of natural divination, since the figures upon which its predictions are based are the outcome either of chance or of voluntary human action.[2] He condemns as superstitious the regarding as signs of the future such trivial occurrences as a sneeze or a dog's running between two persons who are walking together.[3]

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[1] For the opinions of Hincmar, Gratian, Peter Lombard, and other ecclesiastical authorities on this question of witchcraft and impotency see Hansen (1900), p. 153.

[2] *Quodlibet,* XI, 10; *Comment. in Lib. IV Sententiarum,* Dist. 34, Art. 3.

[3] *In Isaiam,* cap. 3; *Summa,* II, ii, 95; *De sortibus, passim.*

[4] *Contra Gentiles,* III, 154.

[5] *Summa,* II, ii, 95, art. 5.

[6] *Ibid.,* art. 6.

Lot casting.

Lot casting of whatever sort is not natural divination. The Bible tells us, however, that God often rules the casting of lots, and "if practices which have a natural or human cause are blameless, much more so are those which depend on divine aid." [4] But Aquinas cautions against an appeal to God to decide the casting of lots unless there is real necessity, or without due reverence and devotion, or for purely human and worldly purposes, or in cases where direct divine inspiration should be sought, as in ecclesiastical elections. As Bede pointed out, it is true that Matthias was selected by lot before Pentecost, but after the reception of the Holy Ghost the seven deacons were elected by the disciples. And when men pry into hidden things more than they should, whether by lot casting or other methods, it is Aquinas' opinion that demons are involved.[5]

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[1] *Summa,* II, ii, 95, art. 7.

[2] *De sortibus,* caps. 3-4.

[3] *Summa,* II, ii, 95, art. 8, and 96.

[4] For the *Lots of the Saints* or *Apostles* see: CLM 14846, 10th century, fols. 106-21, "Sortilegia per literas et sacros libros quorum meminit Gregorius Turonensis" (see *Historia Francorum,* IV, 16); Egerton 821, fols. 54v-56r; BN nouv. acq. 4227, 13th century, in Provençal (consult Felix Rocquain, *Bibl. d. l'École des Chartes,* 1880, pp. 457-74; ed. by C. Chabaneau, with Latin original, Montpellier, 1881, and *Revue des langues romanes,* XVIII-XIX); Vienna 2155, 14th century, fols. 54-56, *Sortes apostolorum.*

[5] Aquinas' discussion occurs in his *De sortibus,* caps. 4-5. This treatise, which he wrote for the duchess of Brabant, is apt to precede or follow his equally brief *De occultis operibus* in the MSS: as in Corpus Christi 225, 14th century, fol. 232; Brussels (Li-

Occult virtues.

As Aquinas differentiated between natural divination and that due to demons, so he distinguishes from illicit magic "the occult works of nature." On this theme he addressed a brief treatise to "a certain knight." [1] Besides those properties of natural objects which accord with the properties of their component elements and so have a manifest origin, there are occult virtues for which men can give no reason,[2] as in the stock illustration of the magnet, as great a favorite with medieval writers as electricity is with modern preachers to inspire faith in the invisible and imperfectly known. Aquinas accounts for the existence of such occult virtues by the influence of the heavenly bodies upon the world of nature. In his *Meteorology,* too, he attributes the wonderful powers of precious stones to "a certain celestial and occult virtue." [3] In this he probably shows the influence of his master Albertus Magnus.

Alchemy and fascination.

Aquinas declares that alchemy is a true, although difficult art, and accounts for the efficacy of its operations by its utilization of occult forces of celestial virtue.[4] Pico della Mirandola noted that while Thomas seemed to deny the art in his *Commentary on the Sentences,* he approved it in his theological *Summa,* which Pico accepted as his last word on

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brary of Dukes of Burgundy) 2471, 15th century; CLM 3754, 14-15th century, fol. 51.

In Bologna University Library 1158, fols. 49v-52v, is a different *De Sortibus* from that of Aquinas. It has six or seven sections: the first inquiring what lots are; the second whether they are good or bad, permitted or prohibited; third, if prohibited, when, and if not always, why not; fourth, whether to cast lots is to tempt God; fifth, whether they were permissible before Christ but not since; sixth, why women are often better at lot-casting than men. The last question, which appears to have been whether the subjects of lot casting could be evil, seems to be left unfinished.

[1] *Opera,* 27, 504-7, *De occultis operibus naturae ad quemdam militem.* Other forms of the title found in the MSS are, *De actionibus occultis naturae, De occultis actionibus rerum,* and *De operationibus occultis.* MSS are numerous: for instance, at Paris alone, BN 3899, 6738A, 6786, 16195; an anonymous *De operibus occultis* in BN 16096, 13th century, fols. 120v-122r, I find on examination to be that of Aquinas. MSS of it at Munich are: CLM 402, 3754, 6942.

[2] *Summa,* II, ii, 96, art. 2, "Res autem naturales habent quasdam virtutes occultas quarum ratio ab homine assignari non potest."

[3] *Meteor.,* III, 9.

[4] *Ibid.,* "Unde etiam ipsi Alchimistae per veram artem alchimiae sed tamen difficilem, propter occultas operationes virtutis coelestis. . . ."

the subject.[1] Spurious works of alchemy were, however, subsequently ascribed to Aquinas in manuscripts of the fifteenth century. Fascination Aquinas also regards as a fact, and practically explains it as due to the power of the evil eye. The eye is affected by the strong imagination of the soul and then corrupts and poisons the atmosphere so that tender bodies coming within its range may be injuriously affected. It is thus that malicious old women injure children,[2]—another faggot added by Aquinas to the pyres of the witchcraft delusion.

Amulets and incantations.

We have hitherto found the practices of wearing amulets and repeating incantations apt to accompany the belief in occult virtues. Aquinas, in discussing "the suspension of sacred words about the neck" cautions that "in all incantations and suspensions of writings" what is written should be seemly, should not be an invocation of demons, should contain no unknown words which may have an evil meaning, and should contain no characters other than the sign of the cross. He quotes the decretal forbidding other observances in collecting medicinal herbs than the sign of the cross and repetition of the Lord's prayer. And he concludes that "suspending divine words about the neck, assuming that they contain nothing false or doubtful, is certainly permissible, but it would be more laudable to abstain from such practices." [3]

Attitude to astrology.

Already a number of passages have shown incidentally that Thomas, like his master Albert, ascribed an important place in natural science to astrological theory. Although he refused to explain magic as worked by the stars, he accounted for the occult works of nature and for natural divination by astral influence. He grants the nobility and incorruptibility of the heavenly bodies but, although aware that Plato and Aristotle attributed souls and intelligences to them, insists that they are material substances. But he regards the stars as

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[1] *Pico della Mirandola* (1586), II, 6, p. 51.

[2] *Contra Gentiles*, III, 103; *Summa*, I, 117, 3.

[3] *Summa*, II, ii, 96, art. 4.

media between "the separate intelligences" and our material world and is inclined to answer affirmatively a question which was more than once put to him, namely, Do the angels move the stars? [1] He also frequently affirms, both in the course of his chief works and in briefer answers to special inquiries that God rules inferior through superior creatures and earthly bodies by the stars.[2] No wise man doubts that all natural motions of inferior bodies are caused by the movement of the celestial bodies.[3] Reason and experience, saints and philosophers, have proved it over and over again. Aquinas then cites two passages from Augustine [4] and Dionysius [5] which do not seem so sweeping as his own assertion: Augustine affirming merely that "grosser and inferior bodies are ruled by subtler and superior ones according to a certain order," and Dionysius saying simply that the rays of the sun aid in the generation of life and nourish and increase and perfect it. Indeed, throughout his arguments for astrology Aquinas, like Albert, seems to stretch authorities upon a Procrustean bed of citation and to make church fathers who are famed for their attacks on astrologers seem to favor the limited rule of the stars over all nature. Aquinas further deems an art of judicial astrology possible, asserting that, besides the crude prognostications which sailors and farmers make from the sky, it is feasible "by some other more occult observations of the stars to employ judicial astrology concerning corporeal effects." [6]

But Aquinas declares that the human will is free and that the soul as an intellectual substance cannot be coerced by

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[1] *Responsio ad Magistrum Joannem de Vercellis. Responsio ad lectorem Venetum*, Artic. 1-2. *De substantiis separatis.*, cap. 1 (*Opera*, 27, 275), "Ipsae etiam animae coelestium corporum si tamen sint animata, inter Angelos sint connumerandae, ut Augustinus definit in *Enchyridione*."

[2] Besides the treatises mentioned in the preceding note, see the *Summa, Tractatus de fide, Meteorologicorum libri IV, De judiciis astrorum ad fratrem Reginaldum, Commentary on Matthew.*

[3] *Opera*, 27, 249, *Ad J. de Vercellis.*

[4] *De trinitate*, III.

[5] *De divinis nominibus*, IV.

[6] *De judiciis astrorum, Opera* 27, 449. MSS of this treatise, too, are numerous: for instance, at Paris BN 6786, 3109, 3899, 6512, 15690; and at Munich CLM 402, 5594, 27001, 3754, 6942.

Extent of and limits to the influence of the stars upon man.

corporeal substances, however superior. He also opines that many occurrences are accidental rather than due to the stars, "as when a man digging a grave finds buried treasure."[1] And "no natural agent can incline one to that which happens accidentally." Aquinas like Albert is also aware, however, that the astrologers themselves agree that the wise man rules the stars, and conversely he himself recognizes that man is not purely an intellectual being, that he often obeys sensual appetite, and that even the mind derives its knowledge from the senses and consequently in a condition disturbed by phantasy. Thus the stars may indirectly affect the human intellect to a considerable extent.[2] Aquinas is also ready to admit that astrologers often make true predictions in events where large numbers of men are concerned and the passions of the majority override the wisdom and will of the few who are able to resist such impulses. On the other hand, he holds that astrologers often err in their predictions concerning individuals.[3] This perhaps refers only to prediction of nativities, for Peter of Prussia, in defending Albertus Magnus against the charge of indulgence in too curious arts, asserted that Aquinas "nowhere in his writings" reproved or attacked astrological interrogations.[4]

Power of astrological images denied.

The question remains, to what extent can men voluntarily avail themselves of the celestial virtues? Aquinas takes the position that men can make use of such virtues only as they find them already existing in nature and that works of human art, as distinct from natural objects, receive no new virtue from the stars but only from the human operator,—"from the conception of the artificer." It is for this reason that Aquinas refuses to explain many operations of magicians as produced by the aid of the constellations. In particular he denies that gems engraved with astronomical figures receive any more virtue from the stars than other gems of the same species without the carving. Figures and characters and human words are immaterial and do not exert force upon matter. If, therefore, astronomical or necromantic or magic images and characters seem to produce marvelous effects, it must be because they are illicitly employed as secret signs to demons who really achieve the results.[1] In short, Aquinas' position concerning images and characters is that of William of Auvergne rather than that of Albertus Magnus.

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[1] *De sortibus*, cap. 4.

[2] *Summa* I, 115, 4. *De fide*, cap. 129.

[3] *Ibid.*, and *De sortibus*, cap. 4.

[4] Peter of Prussia (1621), cap. 15.

The Magi and the star.

Aquinas discusses the problem of the star of Bethlehem both in his *Commentary on Matthew* [2] and in the *Summa*,[3] and the interest which such subjects had for his contemporaries is further shown by these questions which were put to him, "Did the little hands of the infant Jesus create stars?" and "Did the star which appeared to the Magi have the shape of a cross or human form?" [4] The first question was probably suggested by the apocryphal gospels, the second by the homily of the Pseudo-Chrysostom which we have already considered. Aquinas' discussion of the star and Magi is somewhat fuller than that by Abelard but equally drawn from the fathers, especially Chrysostom and Augustine.[5]

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[1] *Contra Gentiles,* III, 105; *Summa,* II, ii, 96, *artic.* 2; *De occultis operibus.*

[2] *Comment. in Math.,* cap. 2.

[3] *Summa,* III, 36.

[4] *Responsio de vi articulis ad lectorem Bisuntinum.*

[5] As we have already been over their arguments, Aquinas' presentation thereof may perhaps be better summarized here than in the text. The Gospel account led the Priscillianists to subject all human acts to fate and the Manicheans to repudiate the Book of Matthew as inculcating a belief in fate. Against them are rehearsed the following arguments. First, as Augustine says (*Contra Faustum,* II, 5), no astrologer asserts that a star will leave its usual position at a man's birth and go to him, as the Gospel narrative asserts that the star in the east did, and hence Matthew confounds rather than defends the error of astrology. Aquinas then quotes with apparent approval the erroneous assertion of Chrysostom (*Homily 6 in Matth.*) that "it is not astronomy's task to tell from the stars who are being born, but to predict the future from the hour of nativity." He also notes Chrysostom's objection that it took the Magi over two years to travel to Bethlehem so that the star must have appeared two years before Christ's birth. This, by the way, would make the date 4 B. C., usually given for the birth of Christ, fit nicely into Münter's date of 6 B. C. for the constellation which portended it. Aquinas also repeats the argument that the star was probably a new creation of God.

But all these criticisms are really quite beside the point, since even according to the Bible story, the Magi, who were evidently astronomers, knew perfectly well what the star meant. Indeed, Aquinas himself repeats the statement that the birth of Christ was announced to them by

Like them he contends that the incident lends no support to the doctrine of nativities. He saves the Magi, however, from the imputation of being workers of magic and dupes of the demons, adopting Jerome's oft-repeated explanation that while in common speech *magi* are the same as enchanters. in the Persian language the word designates philosophers and sages. In this case Aquinas does not force his authorities at all; on the contrary he makes no attempt to improve upon their captious, sophistical, and unconvincing arguments.

Is the *De fato* spurious?

The earliest bibliography of Aquinas' works seems to be that which Ptolemy of Lucca, who had known him personally, gives in his *Ecclesiastical History.*[1] Among the *Opuscula,* which Ptolemy lists with considerable care, giving their *Incipits* as well as their titles, appears the treatise *De fato.*[2] It also appears in the *Table of writings of the Order of Preachers,* a bibliography completed in the second quarter of the fourteenth century.[3] It is not, however, in the official list of Thomas' works drawn up preliminary to his canonization in 1323, and which Father Mandonnet would accept as an absolute criterion of the authentic writings of Aquinas. Other early catalogues of Aquinas' writings are all derived from one of these three prototypes.[4] Our treatise has also

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a star, although to Simon and Anna and to the shepherds by other methods, because they were used to stars. If it was a very unusual kind of star and had a very unusual meaning, all that simply goes to show that a good astrologer is equal to any emergency. Aquinas, indeed, or rather, his authorities, sees the need of stating some other method than astrological skill by which the Magi comprehended the significance of the star. He adduces two explanations from Augustine (*Sermo 374 de Epiphania,* and *De quaest. vet. et nov. test., Quaest. 63*); one that they were admonished by angels, which makes us wonder why there was any star at all; the other, that Balaam had left them a prediction concerning the coming of the star.

Aquinas also repeats something of what the fathers have said on the allegorical significance of the Magi. But on the whole he, like his authorities, fails signally to explain away the astrological significance of the Magi.

[1] *Hist. eccles.* XXIII, 13 (Muratori XI, 1170). Michelitsch *Thomasschriften,* I (1913), p. 126, dates Ptolemy's list between 1312 and 1317, but I do not know why.

[2] It is included in Fretté and Maré, *Opera,* 27, 454-64.

[3] Denifle (1886), p. 237.

[4] Pierre Mandonnet, O. P. *Des Écrits Authentiques de S. Thomas d'Aquin,* Fribourg, 1910.

been attributed to Albertus Magnus,[1] and much of its attitude toward astrology and other occult arts is just the opposite of Thomas' position elsewhere as we have already noted it. I have therefore reserved the *De fato* for separate consideration. This problem of "fate" also sometimes formed the subject of a section of theological *Summae* or other long works, as we have seen in the case of Albertus Magnus, and the manuscripts contain other separate discussions of it [2] than this one associated with Aquinas. As might be expected there is a general resemblance between the aspects of the problem considered and the authorities cited in all these treatises. No doubt it was a common topic of scholastic disputation.

Fate and the stars.

Fate is defined in our treatise as the power of the stars exercised through their movements and relations to one another. After citing in typical scholastic fashion a number of authorities *pro* and *con,*—Aristotle and Boethius are made to supply many arguments for astrology; and after agreeing with most of the favoring arguments and answering some of the opposing ones, the author finally concludes that fate in this sense does prevail. But he distinguishes between fate and fatal necessity, holding that the stars do not impose fatal necessity upon inferiors. While their own motion is "necessary, inevitable, and inalterable, . . . in things generated it is received mutably and contingently because of their changeable natures." Like Aquinas and other authors, he then approvingly quotes Ptolemy's familiar qualification that the stars exert their influence *per aliud et per accidens* and that "the wise man rules the stars." Properties of inferior objects may be used by man to counteract the effects of the constellations, or imaginations of the mind may operate to weaken their force. The author then argues that fate as he has defined it is knowable, in other words that the art of astrology is practicable, that the influence of the stars can be discerned and measured. He goes so far as to defend the assertion of Ptolemy that "when the luminaries are in the head of Algon, that is, of the Gorgon, if Mars shines in hostile aspect, the child then born will be mutilated of hands and feet, and crucified."

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[1] See the list of writings ascribed to Albert in Borgnet's edition of his works, I, lxii. I have also seen the treatise ascribed to Albert in the Explicit of Sloane 2156, 15th century, fols. 154-9.

In Bologna University Library, 1158, 14th century, where the first treatise in the MS at fols. 1-39 is the treatise of Aquinas against William of St. Amour, our treatise together with another *De fato* which follows it and brief treatises on divination and lots are catalogued together as fols. 41-52, "Magistri Alberti theotonici de fato, de divinatione, de sortibus." In the MS itself, however, the only statements as to authorship are headings in the margin. That at the beginning of our *De fato* seems to be "Magri" (Magistri) "Alrti" (or Alxri, rather than Alberti) and a third word which looks like "Theotonici." The second *De fato* is headed "Magri (Magistri) Alexandri" in the upper margin of fol. 45r, and the next treatise is headed, fol. 47r, "Questio de divinatione Alexandri." The anonymous *De sortibus* which follows it is also not Aquinas'. The second treatise on fate considers six questions, of which the last is whether Christ was physically subject to the influence of the constellations like other men.

[2] In BN 16096, 13th century, fol. 138r-, is another which seems different from either of the *De fato's* mentioned in the preceding note. The catalogue questioningly assigns it to Alexander, but is probably misled by a rubric at fol. 139v which seems to be simply a citation ("in sic inscripto libro") and which reads, "Alexandri affridisei ad imperatores antoninum et severinum liber de fato." In this same MS at fols. 120v-122r occurs Aquinas' *De occultis operibus.*

Contradictions between *De fato* and other works of Aquinas.

The *De fato* seems at variance with the opinions of Aquinas as expressed elsewhere upon the following points. It correctly cites Boethius' *De consolatione philosophiae* that the incident of finding hidden treasure while digging a grave is an example of "the inevitable connection of causes which proceeds from the fount of the knowledge of God," whereas Aquinas incorrectly cited it as an illustration of an accidental event. Again, the author of *De fato* regards the story of the Magi and the star of Bethlehem as an evidence of the truth of astrology. He also seems to believe that "intelligence through the motion of the sky rules and causes the intellectual operations of the soul," which Aquinas refused to concede. *De fato* also explains fascination somewhat differently from Aquinas. It appears to agree with him that the soul of the person exercising the power of fascination affects the person fascinated through the sense of sight; but it suggests that the soul of the fascinator has been endowed by the stars with power over the soul of the fascinated, whereas

Aquinas denied that certain men were made magicians by their nativities. Finally *De fato* does not, like Aquinas, reject astrological images, but declares that celestial influence is received by artificial as well as by natural objects, "and therefore the figures of magic images are engraved according to the constellations."

CHAPTER LXI

ROGER BACON

Bibliographical note—Our method of considering him.

I. *Life*

Birth, family, and early life—The years before 1267—Bacon and the mariner's compass—The papal mandate—The composition of the three works—The injunction of secrecy—Roger Bacon and the Franciscans—Bacon's life after 1267—His reported condemnation—Franciscans and science: John Peckham—Was Bacon still writing in 1292?

II. *His Criticism of and Part in Medieval Learning*

Aims and plan of the *Opus Maius*—Bacon's theological standpoint—His scholastic side—Attitude to Aristotle and other authorities—Bacon's critical bent—Criticism easier than construction—Commonplaces of medieval criticism—Debt of Bacon to earlier writers—Limitations of his criticism—Roger Bacon and Albertus Magnus—Bacon's criticism of education applies chiefly to the training of the friars in theology—His other criticisms of contemporary education—His personal motives—Inaccuracy of much of his criticism—Bacon does not regard himself as unique—Instances of ideas which were not new with him—Bacon and the discovery of America—His historical attitude—His "mathematical method"—Its crudity—Its debt to others.

III. *His Experimental Science*

Has been given undue prominence—"Experimental science" distinct from other natural sciences—As a criterion of truth—Lack of method—Bacon and inventions—Marvelous results expected—Fantastic "experiments"—Credulity essential—Good flying dragons—Experiment and magic.

IV. *His Attitude Toward Magic and Astrology*

Magic and astrology—Magic in the past—Magicians and their books still prevalent—Magic a delusion—Some truth in magic—Magic and science—His belief in marvelous "extraneous virtues"—Non-magical fascination—The power of words—Magic and science again—The multiplication of species—William of St. Cloud on works of art and nature compared to magic—The two mathematics—Four objections to the forbidden variety—The rule of the stars—Astrological medicine—Influence of the stars upon human conduct—Planetary conjunctions and religious movements—Was Christ born under the stars?—Operative astrology—Unlikelihood that Bacon was condemned for magic or astrology—Error of Charles in thinking that any stigma rested on Bacon's memory—But his own statements may have given rise to the legend.

V. *Conclusion*

Characteristics of medieval books—Features of the *Opus Maius.*

Appendix I. The Study of Roger Bacon.

Lack of early printed editions of his works—His popular reputation as a magician—Jebb's edition of the *Opus Maius*—General misestimate of Bacon and of medieval science—Roger Bacon and Francis Bacon—Legend of Roger's martyrdom for science—Works of Brewer and Charles—Minor studies of the later nineteenth century—Recent editions of Bacon's works—Continued overestimate of Bacon—Beginnings of adverse criticism—*The Commemoration Essays.*

Appendix II. Roger Bacon and Gunpowder.

Our method of considering him.

CONTEMPORARY with the three learned Dominicans of whom preceding chapters have treated—Albert, Thomas, and Vincent—was the Franciscan friar, Roger Bacon, who in modern times has received so much attention and admiration at the expense of his contemporaries and his age.[1] Happily in

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[1] For bibliography of works on Roger Bacon see Theophilus Witzel's article in *The Catholic Encyclopedia;* G. Delorme, in Vacant and Mangenot, *Dictionnaire de Théologie Catholique,* Paris, 1910, II, 31; Paetow, *Guide to the Study of Medieval History,* 1917, which gives the more recent literature on the subject. The most recent bibliography of Roger Bacon's own writings, whether printed or in manuscript, is that by A. G. Little in the Appendix, pp. 376-425 of *Roger Bacon Essays, contributed by various writers on the occasion of the commemoration of the seventh centenary of his birth,* collected and edited by A. G. Little, Oxford, 1914—which will henceforth be cited as "Little, *Essays,* (1914)." The following is simply a list of those editions of Bacon's writings which I shall have occasion to cite frequently in the ensuing pages, giving the full titles and an abbreviated form for purposes of future reference.

Fr. Rogeri Bacon, Opera quaedam hactenus inedita (ed. J. S. Brewer, London, 1859) in RS Vol. XV. The volume includes part of Bacon's *Opus Tertium,* part of the *Opus Minus,* 313-89, part of the *Compendium Studii Philosophiae,* 393-519, and the *Epistola de Secretis Operibus Artis et Naturae et de Nullitate Magiae,* 523-51. This will henceforth be cited as "Brewer."

The Opus Maius of Roger Bacon. Ed. J. H. Bridges, Vols. I and II, Oxford, 1897; Vol. III (correcting numerous errors in I and II), 1900. This work will be hereafter cited as "Bridges."

F. A. Gasquet, "An Unpublished Fragment of a Work by Roger Bacon," EHR XII, 502. This fragment published by Gasquet is evidently the first part of the *Opus Minus* and will henceforth be cited as "Gasquet."

Part of the Opus Tertium of

the present volume we are in a better position to estimate him fairly. The best, if not the only way to appreciate him aright is by a detailed study of the writings and doctrines of his predecessors and contemporaries. Roger Bacon has hitherto been studied too much in isolation. He has been regarded as an exceptional individual; his environment has been estimated at his own valuation of it or according to some preconceived idea of his age; and his writings have not been studied in relation to those of his predecessors and contemporaries. Thought of as a precursor of modern science, he has been read to find germs of modern ideas rather than scrutinized with a view to discovering his sources. Yet his constant citing of authorities and the helpful footnotes which Bridges, in his edition of the *Opus Maius,* gives to explain these allusions to other scientists, point insistently in the latter direction. When one has gone a step further and has read for their own sake the works of men like Adelard of Bath, William of Conches, and Daniel of Morley in the twelfth century, or William of Auvergne, Robert Grosseteste and Albert Magnus in the early and middle thirteenth century, the true position of Roger Bacon in the history of thought grows clearer. One then re-reads his works with a new insight, finds that a different interpretation may be put upon many a passage, and realizes that even in his most boastful moments Roger himself never made such claims to astounding originality as some modern writers have made for him. Conversely, one is impelled to the conclusion that Bacon's writings, instead of being unpalatable to, neglected by, and far in advance of, his times, give a most valuable

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Roger Bacon. Ed. A. G. Little, Aberdeen, 1912. This will be cited as "Little, *Opus Tertium* (1912)." It includes Duhem's fragment published also by Quaracchi, 1909, *Un fragment inédit de l'Opus tertium de Roger Bacon précédé d'une étude sur ce fragment.*

Fratris Rogeri Bacon Compendium Studii Theologiae. Ed. H. Rashdall, Aberdeen, 1911, in *British Society of Franciscan Studies,* Vol. III. It will be cited as "Rashdall."

Robert Steele, *Opera Hactenus inedita Rogeri Baconi,* Fasc. I, London, 1905; Fasc. II and III and IV and V (Oxon. 1909, 1911, 1913, 1920). This will be cited as "Steele."

picture of medieval thought, summarizing, it is true, its most advanced stages, but also including much that is most characteristic, and even revealing some of its back currents. It is from this standpoint that we shall consider Roger Bacon and endeavor to refute misconceptions that have grown up concerning his life and learning. We shall also, in conformity with our main theme, take particular note of his experimental science, long regarded as the brightest gem in his crown, and of other aspects of his learning which have hitherto not received special or proper treatment, namely, the astrology and magic to which he gives so much space and emphasis and which so seriously affect all his thought, but which probably did not affect his life and the attitude of his age towards him in the way that many have assumed.

I. *Life*

Birth, family, and early life.

Past estimates of Bacon's learning have been greatly affected by their holders' views of his life; but his biography is gradually being shorn of fictions and losing that sensational and exceptional character which gave countenance to the representation of his thought as far in advance of his age. We cannot tell to which of several families of Bacons mentioned in feudal registers and other documents of the times he belonged, and the exact date and place of his birth are uncertain.[1] But he speaks of England as his native land, and in 1267 looks back upon a past of some forty years of study and twenty years of specialization in his favorite branches of learning.[2] In another passage he mentions having spent all his spare time for ten years upon the science of perspective.[3] Also he speaks of one brother as rich, of another as a student, and of his family's suffering exile for their support of Henry III against the barons.[4] He implies that up to 1267 he had not been outside France and England,[1] but he had sent across the seas for material to assist his special investigations and had spent large sums of money.[2]

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[1] Charles Jourdain, "Discussion de Quelques Points de la Biographie de Roger Bacon," in his *Excursions Historiques et Philosophiques à travers le Moyen Age,* Paris, 1888, 131-145.

[2] Brewer, 65 and 59. *Opus Tertium,* caps. 20 and 17.

[3] *Opus Tertium,* cap. 11, Brewer 38.

[4] *Opus Tertium,* caps 3 and 2, Brewer, 16 and 13. Gasquet, 502.

The years before 1267.

Before he became a friar he had written text-books for students, and had worked so hard that men wondered that he still lived. When or why he joined the Franciscans we are not informed,[3] but his doing so is no cause for wonder, for both Orders were rich in learned men, including students of natural science. Bacon tells us that after becoming a friar he was able to study as much as before, but "did not work so much," probably because he now had less teaching to do. For about ten years before 1267, instead of being imprisoned and ill-treated by his order, as was once believed without foundation, he was, as we now know from his own words discovered in 1897, in poor health and "took no part in the outward affairs of the university." This abstention caused the report to spread that he was devoting all his time to writing, especially since many were aware that he had long intended to sum up his knowledge in a *magnum opus,* but he actually "composed nothing except a few chapters, now about one science and now about another, compiled in odd moments at the instance of friends." At least this is what he told the pope in 1267 when trying to excuse himself for having had no completed work ready to submit to the supreme pontiff.[4] During these years he seems to have fallen into some obscurity, since in the *Opus Tertium* he compares his tone in the *Opus Minus* to that of Cicero, when recalled from exile, in the letter in which he humbled himself and congratulated the Roman senate. So Bacon, describing himself probably with some rhetorical exaggeration as an exile for the past ten years from his former scholastic fame,[1] recognizes his own littleness and admires the wisdom of the pope, who has deigned to seek works of scholarship "from me, now unheard by anyone and as it were buried in oblivion." [2]

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[1] *Opus Minus,* Brewer, 318. If, however, we accept as a genuine work of Bacon the letter on retarding the accidents of old age which he is supposed to have sent to Pope Innocent IV (1243-1254), we shall have to admit that he had been "in partibus Romanis." See Little, *Essays,* 4 and 399.

[2] Gasquet, 502.

[3] We are, however, told that he made his profession on the day he entered the Order, i.e., underwent no probationary period. Brewer, *Monumenta Franciscana* (1858) RS IV, 56 and 550.

[4] Gasquet, 500 and *Opus Tertium,* Brewer, 65.

Bacon and the mariner's compass.

R. H. Major's *Prince Henry the Navigator* is responsible for the spread of the story that in 1258 Brunetto Latini saw Friar Bacon at the Parliament at Oxford and was shown by him the secret of the magnetic needle, which Roger dared not divulge for fear of being accused of magic. The supposed letter of Brunetto Latini to the poet Guido Cavalcanti, from which these data are drawn, seems to have been a hoax or fanciful production appearing first in 1802 in the *Monthly Magazine* [3] among "Extracts from the Portfolio of a Man of Letters," who is said to have translated them from "the French patois of the Romansch language." Certainly the mariner's compass was pretty well known in Bacon's time, nor are we informed of any case where it involved its possessor in a trial for magic. Bacon says in one passage that if the experiment of the magnet with respect to iron "were not known to the world, it would seem a great miracle." [4] In another place he grants that even the common herd of philosophers know of the magnetic needle; he merely criticizes their belief that the needle always turns towards the north star; Roger thinks that it can be made to turn to any other point of the compass if only it has been properly magnetized.[5] Perhaps the Latini story was suggested by a third passage, where Bacon says, in order to illustrate his statement that philosophers have sometimes resorted to charms and incantations to hide their secrets from the unworthy, "As if, for instance, it were quite unknown that the magnetic needle attracts iron and someone wishing to perform this operation before the people should make characters and utter incantations, so that they might not see that the operation of attraction was entirely natural." [1]

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[1] Albertus Magnus speaks more literally of himself as an exile (*Mineralium,* III, i, 1, "Exul enim aliquando factus fui, longe vadens ad loca metallica ut experiri possem naturas metallorum") : but no one has ever inferred from this that he was persecuted. Perhaps, however, Father Mandonnet would infer from the passage and from the favorable attitude of the treatise on minerals towards astrological images that Bacon was really the author.

[2] *Opus Tertium,* cap. 1, Brewer, 7.

[3] *The Monthly Magazine or British Register,* XIII, 449.

[4] Bridges, II, 218.

[5] *Opus Minus,* Brewer, 383-384.

The papal mandate.

Bacon's career centers about a papal mandate which was despatched to him in the summer of 1266. Guy de Foulques, who became Clement IV on February 5, 1265, had at some previous time requested Bacon to send him the *scriptum principale* or comprehensive work on philosophy which he had been led to think was already written.[2] On June 22, 1266, he repeated this request in the form of a papal mandate, which is extant.[3] The former letter is lost, but both Bacon and the pope refer to it.[4] Somehow writers on Bacon have paid little heed to this first request, have assumed that Bacon wrote his three works to the pope in about a year [5] despite the "impediments" upon which he dwells, and have therefore been filled with admiration at the superhuman genius which could produce such works at such short notice while laboring under such difficulties.[1] But this is assuming that Roger had done nothing in the considerable interval between the two mandates. And why does he keep apologizing for "so great delay in this matter," and "Your Clemency's impatience at hope deferred."[2] Moreover, his excuses do not all apply to the same period, and most of them are excuses for not having composed a full exposition of philosophy rather than for not having composed sooner the *Opus Maius,* which Roger regarded as a mere preamble to philosophy. One set of excuses explains why he had no comprehensive work ready when the first request arrived.[3] A second set explains why he had not written it in the interval between the two mandates.[4] A third set explains why he finally does not write it at all but sends instead an introductory treatise, the *Opus Maius,* supplemented by two others, the *Opus Minus* and *Opus Tertium.* Of course some excuses hold equally good for all three periods. But he states in the third treatise that in writing the second he was free from some of the "impediments" which had hampered his composition of the *Opus Maius.*[5] As he also says that one reason for writing the *Opus Minus* was lest the *Opus Maius* be lost amid the great dangers of the roads at that time, one infers that the latter work was despatched before the other. Moreover, the *Opus Minus* opens with a eulogy of the pope which is absent in the *Opus Maius*,[1] in which there are very few passages to suggest that it is addressed to the pope, or written later than 1266.[2]

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[1] *Epistola de Secretis Operibus,* cap. 2. Brewer, 525.

[2] Gasquet, 511: "Scripto principali, quod vestra postulat reverentia." *Opus Tertium,* Brewer, 58: "Propter vestrae gloriae mandatum, de quo confundor et doleo quod non adimplevi sub forma verborum vestrorum, ut scriptum philosophiae mitterem principale." Also, p. 18.

[3] Brewer, 1; Bridges I, 1-2, note: Wadding, *Annal. Minor,* IV, 265; Martene, *Thesaurus Novus Anecdotorum,* II 358; E. Jordan, *Les registres de Clément* IV (1265-1268) . . . *d'après les manuscripts originaux des archives du vatican,* Quatrième Fascicule, Paris, 1904, Appendice II, p. 384, No. 1081.

[4] Brewer, 1: "Opus illud quod te dilecto filio Raymundo de Landuno communicare rogavimus in minori officio constituti." *Opus Tertium,* Brewer, 14; Bacon says that Albert and William of Shyrwood could not send the pope what he has written, "infra tantum tempus . . . a vestro mandato; et sicut nec ab ultimo, sic nec a primo." Gasquet, 500: "Sed licet pleno desiderio quod iniunctum est complere pro posse meo sim teste Deo paratissimus, cum quoniam in minori officio constituti postulatis non fuerunt composita que iussistis" and "utrumque mandatum" and "antequam primum vestre dominationis recepi mandatum." The following sentence (*Opus Tertium,* Brewer, 13) also seems to refer to the former mandate, despite the "ultimo," "Non enim quando ultimo scripsistis fuerunt composita quae iussistis, licet hoc credebatis."

[5] Little, *Essays* (1914), 11: "His first project was an elaborate one, including a systematic and scientific treatment of the various branches of knowledge; he worked at this, writing parts of the *Communia Naturalium* and *Communia Mathematicae,* for some months ('till after Epiphany,' i.e., January 6, 1267), but found it impossible. He then started again on a more modest scale, and wrote in the next twelve months the preliminary treatise known as the *Opus Maius,* which was supplemented by the *Opus Minus,* and subsequently, by the *Opus Tertium."*

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[1] Brewer, xlv.

[2] *Opus Tertium,* Brewer, 14; "Non igitur mirandum si ego dilationem tantam fecerim in hac parte." *Ibid.,* 16-17: "Multotiens dimisi opus, et multotiens desperavi et neglexi procedere." *Ibid.,* 17: "Tanta dilatio in hoc negotio . . . vestrae clementiae taedium pro spe dilata," and other passages.

[3] These excuses are listed in Gasquet, 500, to "antequam primum vestre dominationis recepi mandatum"; and are repeated in part in *Opus Tertium,* Brewer, 13.

[4] To this period the difficulties listed in *Opus Tertium,* Brewer, 15-17 (middle), would seem to apply. In Brewer, 16, and Gasquet, 502, Bacon states that to get money to meet the expenses incident to the composition of his work he had sent to his rich brother in England, but received no response because "exiles and enemies of the king occupied the land of my birth," while his own family had been exiled as supporters of the crown and ruined financially. All this must have occurred before the arrival of the second papal letter in 1266, for Simon de Montfort had been slain and the barons defeated in 1265.

[5] *Opus Tertium,* Brewer, 5: "Et impedimentorum remedia priorum nactus."

The composition of the three works.

The *Opus Maius*, therefore, was practically finished, if not already sent, when the papal mandate of 1266 reached Bacon. When Roger learned that Foulques as pope was still interested in his work, visions of what the apostolic see might do for his programme of learning and himself flashed before his mind, and, after a fresh but vain effort at a *scriptum principale*, which kept him busy until Epiphany, he composed the supplementary treatise, the *Opus Minus*, with its adulatory introduction to Clement IV, with its excuses for sending or having sent a preambulatory treatise instead of a complete work of philosophy, with its hints that such a final treatise can be successfully completed only with the financial backing of the unlimited papal resources, with its analysis of the preceding work for the benefit of the busy pope and its suggestions as to what portions of it he might profitably omit, and with its additions of matter which in the *Opus Maius* Roger had either forgotten or at that time had not been in a position to insert. The third work, *Opus Tertium,* is of the same sort but apparently more disorderly in arrangement, and looser and more extravagant in its tone. Presumably it was undertaken to remind the pope again of Bacon's existence and proposals; it is even conceivable that Roger was a little unstrung when he composed it; it has been suggested that it was left unfinished and never sent to the pope, who died in 1268. A part at least of the *Opus Tertium* was written in 1267.[1]

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[1] As Bacon himself states in the *Opus Tertium*, Brewer, 7: "Primo igitur in opere Secundo."

[2] I cannot agree with Gasquet, 497, that it "is obvious from numberless expressions in the work itself" that the *Opus Maius* was "addressed to the pope directly." The last chapter of the first book in Bridges's text is evidently addressed to the pope, but it is identical with a portion of the *Opus Minus* and evidently does not belong in the *Opus Maius* and is not found in the two oldest manuscripts. Similarly a passage of some 16 pages in Bridges on calendar reform, which gives the present year as 1267, is practically identical with a chapter of the *Opus Tertium* and was evidently transferred from that work to the *Opus Maius* at some later date. When we have excluded these passages the work is surprisingly free, compared to the other two works, from passages suggesting that it is addressed to the pope. The one mention of the "Apostolic See" (Bridges, I, 77; III, 94) is impersonal and does not imply that Foulques was pope, and does not occur in one of the manuscripts. Epithets such as "Your Wisdom" (Bridges, I, 17, 23, 305), "Your Highness" (I, 210; II, 377), "Your Glory" (I, 305; III, 96), "Your Reverence" (I, 376; II, 219), "Your Holiness" (I, 81; III, 101), "Your Beatitude" (I, 2, 72; III, 88) do not occur frequently and are equally applicable to a cardinal, or not found in all the manuscripts, suggesting the possibility of their having been inserted later.

The injunction of secrecy.

The extant papal mandate orders Bacon not only to send his book but to state "what remedies you think should be applied in those matters which you recently intimated were of so great importance," and to "do this without delay as secretly as you can." [2] This allusion to matters of importance and this injunction of secrecy have cast a certain veil of mystery over the three works and the relations of Roger and the pope. Observance of secrecy may have been intended to guard against such frauds of copyists as we shall soon hear Bacon describe, or to secure some alchemistic arcana or practical inventions which the pope had been led to expect from him. Indeed, so far as alchemy was concerned, Bacon observed the injunction of secrecy so strictly that he divided his discussion of the subject among four different treatises sent to the pope at different times and by different messengers, so that no outsider might steal the precious truth. It must be added that even after receiving all four instalments, the pope would not have been much nearer the philosopher's stone than before.[1]

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[1] Such seems to me the most plausible theory of the writing of the three works and the one which agrees best with Bacon's own statements; but it is only a hypothesis from the printed texts of his works which should be verified by examination of the manuscripts. Probably some of Bacon's statements can be interpreted to conflict with this hypothesis, but they sometimes conflict with each other, and he could not even keep the *scriptum principale* and *Opus Maius* distinct in his own mind according to Brewer's text (p. 3, "duo transmisi genera scripturarum: quorum unum est principale," and p. 5, "principalis scripturae," whereas at p. 60 we read, "Patet igitur quod scriptum principale non potui mittere"). See also Gasquet, p. 503, and *Opus Tertium*, Brewer, p. 58. I have been stimulated by but cannot accept the conclusions of Father Mandonnet's "Roger Bacon et la Composition des Trois 'Opus'," *Revue Néo-Scolastique* (Louvain, 1913), pp. 52-68 and 164-180. Mandonnet holds that the *Opus Maius* was written *after* the other two works, which were never finished nor sent, but from which Roger took some passages to insert in the *Opus Maius,* which Mandonnet believes was sent only in 1268.

[2] "Quae tibi videntur adhibenda remedia circa illa, quae nuper esse (occasione?) tanti discriminis intimasti: et hoc quanto secretius poteris facias indilate." E. Jordan, *Les Registres de Clement IV,* etc., gives *"esse,"* which would seem the correct reading rather than the *"occasione"* of Martene and Brewer. If one follows their version, as I did in "The True Roger Bacon," 242-43, the passage would have to be translated, "What remedies you think should be applied in those matters indicated by you recently on so critical an occasion." But apparently there was no such crisis.

Roger Bacon and the Franciscans.

Another moot question in Bacon's biography besides that of the composition of the three works is that of his relations with the Franciscan Order. We have seen that it was natural for him to join it, and that the change, at first at least, seemed one for the better. Bacon, however, found irksome the rule made by the order in 1260, as a consequence of the publication in 1254 of Gerard's heretical *Introductorius in Evangelium Aeternum,* that in the future no Franciscan should publish anything without permission.[2] Roger wished to employ amanuenses even in composing his works, and these men, he tells the pope, would often divulge "the most secret writings," [3] and so involve one in unintentional violation of the above rule. "And therefore," says Bacon, "I did not feel the least bit like writing anything." [4] For a man so easily discouraged one cannot feel much sympathy. There is however another important inference from his statement: instead of his writings being neglected by his age, they are so valued that they are pirated before they have been published. Moreover, this rule of his order should not have hampered Bacon much in writing for the pope; indeed, Roger himself implies that he was exempted from this restriction in the earlier request from the cardinal as well as in the later papal mandate. Raymond of Laon, Bacon grants, had correctly informed "Your Magnificence, as both the mandates state," concerning this regulation, though he had given a wrong impression as to what Bacon already had written.[1]

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[1] Part of the *Opus Tertium* of Roger Bacon (ed. A. G. Little, Aberdeen, 1912), 80-82. This passage is the fourth one and in it Bacon lists the three earlier statements: "Scripsi in tribus locis Vestre Glorie de huiusmodi secretis." Roger ultimately decides that he will not reveal the whole secret even in this fourth instalment, because alchemists never put the full truth into writing; he therefore "reserves some points for word of mouth."

[2] See the article on "Roger Bacon" by Theophilus Witzel in the Catholic Encyclopedia.

[3] In our chapter on Galen we noted his similar complaints, and in the coming chapter on Peter of Abano we shall speak of his similar experience in having his *Phisionomia* stolen. Daunou wrote of Vincent of Beauvais in the *Histoire Littéraire,* XVIII (1835), p. 453: "il dit des occupations pénibles qui interrompaient son travail d'écrivain, et le forçaient à employer des copistes."

[4] Gasquet, 500. "Et ideo componere penitus abhorrebam," etc.

We have heard from Bacon's own mouth that he did little public teaching after becoming a friar, that he had as much time for private study as ever, and that everybody supposed him to be at work at his *magnum opus*. Yet in the *Opus Minus* he grumbles that "his prelates were at him every day to do other things" [2] before he received the first mandate from the cardinal, and that even thereafter he was unable to excuse himself fully from their demands upon his time, "because Your Lordship had ordered me to treat that business secretly, nor had Your Glory given them any instructions." [3] In the *Opus Tertium* he describes the same situation in stronger language: "They pressed me with unspeakable violence to obey their will as others did," and "I sustained so many and so great setbacks that I cannot tell them." [4] On how we interpret a few such passages as these depends our estimate of the attitude of the Franciscan Order before 1267 to Bacon and his ideas and researches. He gives so many other reasons why he has no comprehensive work of philosophy ready for the pope that this attitude of his superiors seems a relatively slight factor. He needed much money, he needed expensive instruments, he needed a large library, he needed "plenty of parchment," he needed a corps of assistant investigators and another of copyists with skilled superintendents to direct their efforts and insert figures and other delicate details. It was a task beyond the powers of any one man; besides, he was in ill-health, he felt languid, he composed very slowly. Shall we blame his superiors for not providing him with this expensive equipment; and are we surprised, when we remember that the mandates directed him to send a book supposed to be already finished, that his superiors continued to ask of him the performance of his usual duties as a friar? Their attitude can scarcely be regarded as persecution of Bacon or hostility to his science. On the other hand, Clement IV must be given credit for his effort to elicit from Bacon a *scriptum principale;* and it may well be doubted if Roger would have produced anything equivalent to the *Opus Maius, Opus Minus* and *Opus Tertium* without this papal encouragement.

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[1] Gasquet, 500.

[2] *Ibid.*

[3] *Ibid.*, 502.

[4] *Opus Tertium*, Brewer, 15.

Bacon's life after 1267.

In 1272 in the *Compendium Studii Philosophiae* Bacon lays bare the failings of "the two orders" as if he belonged to neither, but he then proceeds to refute indignantly those masters at Paris who have tried to argue that the state of the higher secular clergy, such as bishops, is more perfect than that of the religious.[1]

His reported condemnation.

In 1277, however, we learn "solely on the very contestable authority of the Chronicle of the XXIV Generals," [2] a work written about 1370, although containing earlier matter,[3] that at the suggestion of many friars the teaching of "Friar Roger Bacon of England, master of sacred theology," was condemned as containing "some suspected novelties," that Roger was sentenced to prison, and that the pope was asked to help to suppress the dangerous doctrines in question. It has been a favorite conjecture of students of Bacon that he incurred this condemnation by his leanings toward astrology and magic; but, as we shall see later, his views on these subjects were not novelties. He shared them with Albertus Magnus and other contemporaries, and there seems no good reason why they should have got him into trouble. Suffice it here to note that the wording of the chronicle suggests nothing of the sort, but rather some details of doctrine, whereas had Bacon been charged with magic, we may be pretty sure that so sensational a feature would not have passed unmentioned.

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[1] *Compendium Studii Philosophiae,* Brewer, 399, 425, 431.

[2] G. Delorme, "Roger Bacon," in Vacant and Mangenot, *Dictionnaire de Théologie Catholique,* II (1910); "Ce fait basé uniquement sur l'autorité fort contestable de la chronique des xxiv généraux," *Analecta Franciscana* (Quaracchi, 1897), III, 460.

[3] Little, *Essays* (1914), 6, note 1.

Franciscans and science: John Peckham.

How absurd it is to think that the Franciscan Order was opposed to Bacon's pursuit of natural and experimental science, or that he was alone among the members of that order in the pursuit of such subjects, may be inferred from a glance at the career of John Peckham who from 1279 to his death in 1292 was archbishop of Canterbury.[1] According to a letter of Bacon's favorite, Adam Marsh, Peckham entered the Franciscan Order about 1250. He had been educated in France but about 1270 became lector of his order at Oxford. He also became the ninth provincial minister of the Franciscans in England, and had been called to Rome by the pope to be *Lector sacri palatii* before his nomination by the pope to the archbishopric of Canterbury. Yet this Franciscan who rose so high in the church was the author of a treatise on Perspective, one of the five subjects which Bacon held could be of such service to the church and yet were being so woefully neglected. In his *Perspectiva communis,* which was printed at Venice in 1504, Peckham talks of such matters as the reflection of visible rays and experiment. A work on the sphere and a *Theory of the Planets* which exists only in manuscript are also attributed to him. It has even been suggested that he was the bright lad John whom Bacon sent to explain his work to the pope, but Peckham was evidently too old in 1267 to fill that rôle. Bartholomew of England was another Franciscan interested, as we have seen, both in natural science and astrology, and other Friar Preachers than Albertus Magnus and Aquinas showed the same interest.

Was Bacon still writing in 1292?

This is about all that we know of Bacon's life except the dates of one or two more of his works. Mr. Little regards it as "certain that Roger's last dated work was written in

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[1] For the facts of his career see DNB.

1292."[1] This was his treatise on the study of theology, which in one passage gives the year as 1292 and in another speaks of "forty years and more" as having elapsed since 1250.[2] It is rather surprising to find his literary activity continuing so late, since in 1267 he wrote as if well along in life.

II. *His Criticism of and Part in Medieval Learning*

Aims and plan of the *Opus Maius.*

We turn from Bacon's life to his writings, and shall center our attention upon his three works to the pope. In them he had his greatest opportunity and did his best work both in style and substance. They embody most of his ideas and knowledge. Much, for example, of the celebrated "Epistle concerning the secret works of art and nature and the nullity of magic" sounds like a later compilation from these three works.[3] Two of them are merely supplementary to the *Opus Maius* and are parallel to it in aims, plan, and contents. Its two chief aims were to demonstrate the practical utility of "philosophy," especially to the Church, and secondly, to reform the present state of learning according to Bacon's idea of the relative importance of the sciences. Having convinced himself that an exhaustive work on philosophy was not yet possible, Roger substituted this introductory treatise, outlining the paths along which future study and investigation should go. Of the thirty divisions of philosophy he considers only the five which he deems the most important and essential, namely, the languages, "mathematics," perspective or optic, "experimental science" (including alchemy), and moral philosophy, which last he regards as "the noblest" and "the mistress of them all."[4] Treated in this order, these "sciences" form the themes of the last five of the seven sections of the *Opus Maius.* Inasmuch as Roger regarded himself as a reformer of the state of learning, he prefixed a first part on the causes of human error to justify his divergence from the views of the multitude. His second section develops his ideas as to the relations of "philosophy" and theology.

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[1] *Essays,* 27; Mandonnet, *Siger de Brabant* (second ed.) I, 248 questions this date.

[2] Rashdall, 34 and 53.

[3] Compare, for instance, the opening paragraph of the sixth chapter with Duhem, 153-54, and Little, *Opus Tertium* (1912), 50-51.

[4] Gasquet, 509.

Bacon's theological standpoint.

The mere plan of the *Opus Maius* thus indicates that it is not exclusively devoted to natural science. "Divine wisdom," or theology, is the end that all human thought should serve, and morality is the supreme science. Children should receive more education in the Bible and the fundamentals of Christianity, and spend less time upon "the fables and insanities" of Ovid and other poets who are full of errors in faith and morals.[1] In discussing other sciences Bacon's eye is ever fixed upon their utility "to the Church of God, to the republic of the faithful, toward the conversion of infidels and the conquest of such as cannot be converted." [2] This service is to be rendered not merely by practical inventions or calendar reform or revision of the Vulgate, but by aiding in most elaborate and far-fetched allegorical interpretation of the Bible. To give a very simple example of this, it is not enough for the interpreter of Scripture to know that the lion is the king of beasts; he must be so thoroughly acquainted with all the lion's natural properties that he can tell whether in any particular passage it is meant to typify Christ or the devil.[3] Also the marvels of human science strengthen our faith in divine miracles.[4] Bacon speaks of philosophy as the handmaid of "sacred wisdom"; [5] he asserts that all truth is contained in Scripture, though philosophy and canon law are required for its comprehension and exposition, and that anything alien therefrom is utterly erroneous.[6] Nay more, the Bible is surer ground than philosophy even in the latter's own field of the natures and properties of things.[7] Furthermore, "philosophy considered by itself is of no utility." [8] Bacon believed not only that the active intellect (*intellectus agens*) by which our minds are illuminated was from God and not an integral part of the human mind,[1] but that all philosophy had been revealed by God to the sainted patriarchs and again to Solomon,[2] and that it was impossible for man by his own efforts to attain to "the great truths of the arts and sciences." [3] Bacon alludes several times to sin as an obstacle to the acquisition of science; [4] on the other hand, he observes that contemporary Christians are inferior morally to the pagan philosophers, from whose books they might well take a leaf.[5] All this gives little evidence of an independent scientific spirit, or of appreciation of experimental method as the one sure foundation of scientific knowledge. We see how much of a medieval friar and theologian and how little of a modern scientist Roger could be. It must, of course, be remembered that he is trying to persuade the Church to support scientific research; still, there seems to be no sufficient reason for doubting his sincerity in the above statements, though we must discount here as elsewhere his tendency to make emphatic and sweeping assertions.

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[1] *Opus Tertium,* Brewer, 54-55.

[2] This was a favorite formula with Bacon; see *Opus Tertium,* Brewer, 3-4, 20; Gasquet, 502, 509.

[3] *Opus Minus,* Brewer, 388.

[4] *Opus Tertium,* Brewer, 52.

[5] Gasquet, 509.

[6] *Opus Tertium,* Brewer, 81.

[7] Bridges, I, 43.

[8] *Ibid.,* 56.

Bacon's scholastic side.

Writers as far back as Cousin [6] and Charles have recognized that Bacon was interested in the scholasticism of his time as well as in natural science. His separate works on the Metaphysics and Physics of Aristotle are pretty much the usual sort of medieval commentary; [7] the tiresome dialectic of the *Questions on Aristotle's Physics* is well brought out in Duhem's essay, "Roger Bacon et l'Horreur du Vide." [1] Bacon's works dedicated to the pope, on the contrary, are written to a considerable extent in a clear, direct, outspoken style; and the subjects of linguistics, mathematics, and experimental science seem at first glance to offer little opportunity for metaphysical disquisitions or scholastic method. Yet, here too, much space is devoted to intellectual battledore and shuttlecock with such concepts as matter and form, moved and mover, agent and patient, element and compound.[2] Such current problems as the unity of the intellect, the source of the *intellectus agens,* and the unity or infinity of matter are introduced for discussion,[3] although the question of universals is briefly dismissed.[4]

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[1] Bridges, I, 41. Bacon is believed to have rather misrepresented the position of William of Auvergne on this point, when he says that William twice reproved at Paris those who held the active intellect to be part of the soul. N. Valois, *Guillaume d'Auvergne* (Paris, 1880), 289-290; E. Charles, *Roger Bacon: sa Vie, ses Ouvrages, ses Doctrines* (Bordeaux, 1861), p. 327.

[2] Bridges, I, 45; Gasquet, 508; *Opus Tertium*, Brewer, 24.

[3] Bridges, I, 45.

[4] *Ibid.*, II, 170; *Compendium Studii Philosophiae*, Brewer, 405, 408.

[5] *Opus Tertium*, Brewer, 50: "Mirum enim est de nobis Christianis, qui sine comparatione sumus imperfectiores in moribus quam philosophi infideles. Legantur decem libri Ethicorum Aristotelis et innumerabiles Senecae, et Tullii, et aliorum, et inveniemus quod sumus in abysso vitiorum."

[6] V. Cousin, *Journal des Savants* (1848), 467.

[7] Little, *Essays* (1914), 4: "They are in the prevalent dialectic style, and perhaps might be put into the class of works which Bacon afterwards ridiculed as 'horse-loads.'"

Attitude to Aristotle and other authorities.

Two other characteristic traits of scholasticism are found in the *Opus Maius,* namely, continual use of authorities and the highest regard for Aristotle, *summus philosophorum,*[5] as Bacon calls him. Because in one passage in his *Compendium Studii Philosophiae* Bacon says in his exaggerated way that he would burn all the Latin translations of Aristotle if he could,[6] it has sometimes been assumed that he was opposed to the medieval study of Aristotle. Yet in the very next sentence he declares that "Aristotle's labors are the foundations of all wisdom." What he wanted was more, not less Aristotle. He believed that Aristotle had written a thousand works.[7] He complains quite as much that certain works of Aristotle have not yet been translated into Latin as he does that others have been translated incorrectly. As a matter of fact, he himself seems to have made about as many mistakes in connection with the study of Aristotle as did anyone else. He thought many apocryphal writings genuine, such as the *Secret of Secrets,*[8] an astrological treatise entitled *De Impressionibus Coelestibus,*[9] and other writings concerning "the arcana of science" and "marvels of nature." [1] He overestimated Aristotle and blamed the translators for obscurities and difficulties which abound in the Greek text itself. He declares that a few chapters of Aristotle's *Laws* are superior to the entire *corpus* of Roman law.[2] His assertion that Robert Grosseteste paid no attention to translations of Aristotle is regarded as misleading by Baur.[3] He nowhere gives credit to Albertus Magnus and Thomas Aquinas for their great commentaries on Aristotle [4] which are superior to any that he wrote. He bases some of his own views upon mistranslations of Aristotle, substituting, for instance, "matter" for "substance"—a mistranslation avoided by Albert and Thomas.[5]

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[1] Little, *Essays* (1914), 241-284.

[2] *Opus Minus,* Brewer, 360-367.

[3] Bridges, I, 38, 143; *Opus Tertium,* Brewer, 120.

[4] Bridges, I, 42.

[5] *Opus Tertium,* Brewer, 6.

[6] *Compendium Studii Philosophiae,* Brewer, 469.

[7] *Ibid.,* 473. Rashdall, 34.

[8] He wrote a commentary on it; see Tanner MSS, 116, Bodleian Library; ed. Steele (1920).

[9] Bridges, I, 389.

Bacon's critical bent.

Despite its theological and scholastic proclivities, Bacon's mind had a decidedly critical bent. He was, like Petrarch, profoundly pessimistic as to his own times. Church music, present-day sermons, the immorality of monks and theologians, the misconduct of students at Oxford and Paris, the wars and exactions of kings and feudal lords, the prevalence of Roman Law—these are some of the faults he has to find with his age.[6] The *Opus Maius* is largely devoted, not to objective presentation of facts and discussion of theories, but to subjective criticism of the state of learning and even of individual contemporary scholars. This last is so unusual that Bacon excuses himself for it to the pope in both the supplementary treatises.[7] Several other works of Bacon display the same critical tendency. The *Compendium Studii Philosophiae* enlarges upon the complaints and criticisms of the three works. In the *Tractatus de Erroribus Medicorum* he detected in contemporary medicine "thirty-six great and radical defects with infinite ramifications." [1] But in medicine, too, his own contributions are of little account. In the *Compendium Studii Theologiae,* after contemptuous allusion to the huge *Summae* of the past fifty years, he opens with an examination of the problems of speculative philosophy which underlie the questions discussed by contemporary theologians. As far as we know that is as far as he got. And in the five neglected sciences to which his *Opus Maius* was a mere introduction he seems to have made little further progress than is there recorded; it has yet to be proved that he made any definite original contribution to any particular science.

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[1] *Compendium Studii Philosophiae,* Brewer, 473.

[2] *Opus Tertium,* Brewer, 50; *Compendium Studii Philosophiae,* Brewer, 422.

[3] Ludwig Baur, *Die Philosophischen Werke des Robert Grosseteste* (Münster, 1912; Bd. IX in Baeumker's *Beiträge z. Gesch. d. Philos. d. Mittelalters*), p. 15.

[4] Cousin, *Journal des Savants* (1848), 300, concludes that because Bacon asserts that the Politics of Aristotle is not yet in use among the Latins, Albertus and Aquinas did not write their commentaries on this work until after 1266.

[5] K. Werner, "Die Kosmologie und Allgemeine Naturlehre des Roger Bacon," in *Sitzungsberichte* of the Vienna Academy, ph.-hist. Cl. (Vienna, 1879), XCIV, 495. For further errors by Bacon concerning the text of Aristotle see Duhem, "Roger Bacon et l'Horreur du Vide," in Little, *Essays* (1914), 254 and 259.

[6] *Opus Tertium,* Brewer, 302-304; *Compendium Studii Philosophiae,* Brewer, 412, 429, 399, 418 ff. and *Opus Tertium,* 84 ff.

[7] Gasquet, 503; Brewer, 29-30.

Criticism easier than construction.

After all, we must keep in mind the fact that in ancient and medieval times hostile criticism was more likely to hit the mark than were attempts at constructive thought and collection of scientific details. There were plenty of wrong ideas to knock down; it was not easy to find a rock foundation to build upon, or materials without some hidden flaw. The church fathers made many telling shots in their bombardment of pagan thought; their own interpretation of nature and life less commands our admiration. So Roger Bacon, by devoting much of his space to criticism of the mistakes of others and writing "preambles" to science and theology, avoided treacherous detail—a wise caution for his times. Thus he constructed a sort of intellectual portico more pretentious than he could have justified by his main building. To a superficial observer this portico may seem a fitting entrance to the temple of modern science, but a closer examination discovers that it is built of the same faulty materials as the neglected ruins of his contemporaries' science.

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[1] E. Withington, "Roger Bacon and Medicine," in Little, *Essays* (1914), 347.

Commonplaces of medieval criticism.

Merely to have assumed a critical point of view in the middle ages may seem a distinction; but Abelard, Adelard of Bath, William of Conches, and Daniel Morley were all critical, back in the twelfth century. Moreover, our estimate of any critic must take into account how valid, how accurate, how original and how consistent his criticisms were and from what motives they proceeded. Some of Bacon's complaints the reader of medieval literature has often listened to before. What student of philosophy in the twelfth and thirteenth centuries had not sighed at the invasion of the Roman law into school and church and state? What devotee of astronomy had failed to contrast its human interest and divine relationships with the dry drubbing of the jurists? What learned man had not expressed his preference for the wise and the experts (*sapientes*) over the *vulgus* or common herd? The great secrets of learning and the danger of casting pearls before swine were also quite familiar concepts. If Bacon goes a step farther and speaks of a *vulgus studentium* and even of a *vulgus medicorum,* he is only refining a medical commonplace or quoting Galen.

Debt of Bacon to earlier writers.

In Bacon's discussion of the four causes of human error his attack upon undue reliance on authority has often seemed to modern readers most unusual for his age. But all his arguments against authority are drawn from authorities;[1] and while he seems to have got a whiff of the spirit of rationalism from such classical writers as Seneca and Cicero, he also quotes the *Natural Questions* of his fellow-countryman, Adelard of Bath, who in the early twelfth century had found the doctrine of the schools of Gaul as little to his liking as was that of Paris to Roger's taste, and whom we have heard reprove his nephew for blind trust in authorities.[2] Bacon's fourth cause of human error, the conceal-ment of ignorance by a false show of learning, might well have been suggested by Daniel Morley's satire on the *bestiales* who occupied chairs in the schools of Paris "with grave authority," and reverently marked their Ulpians with daggers and asterisks, and seemed wise as long as they concealed their ignorance by a statuesque silence, but whom he found "most childish" when they tried to say anything. Or by the same Daniel's warning not to spurn Arabic clarity for Latin obscurity; and his charge that it was owing to their ignorance and inability to attain definite conclusions that Latin philosophers of his day spun so many elaborate figments and hid "uncertain error under the shadow of ambiguity." [1]

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[1] Rashdall says in the introduction to his edition of Bacon's *Compendium Studii Theologiae* (Aberdeen, 1911), p. 3: "There is a certain irony in the fact that the writer's argument in favor of independent thinking as against authority consists chiefly of a series of citations."

[2] Bridges, I, 5-6 and also p. 7, where Bacon quotes another sentence from Adelard without nam-

Limitations of his criticism.

Bacon's criticisms have usually been taken to apply to medieval learning as a whole, but a closer examination shows their application to be much more limited. In the first place, he is thinking only of the past "forty years" in making his complaints; in the good old days of Grosseteste, Adam Marsh, William Wolf, and William of Shyrwood things were different, and scholarship flowed smoothly, if not copiously, in the channels marked out by the ancient sages; [2] nor does Bacon deny that there was a renaissance of natural science and an independent scientific spirit still farther back in the twelfth century.

Secondly, except for his tirades against the Italians and their civil law, Bacon's criticisms apply to but two countries, France and England, and two universities, Oxford and Paris. Also those few contemporaries whom he praises are either his old Oxford friends or scattered individuals in France. Of the state of learning in Italy, Spain, and Germany he says little and apparently knew little. Amid his sighing for some prince or prelate to play the patron to science, he never mentions Alfonso X of Castile, who was so interested in the "mathematics" and occult science which

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ing him, "Et ideo multi . . . cur a tergo non scribitis."

[1] See chapter 42 on Daniel Morley.

[2] Bridges, I, 17; *Opus Tertium*, Brewer, 70, 91, 187.

were so dear to Bacon's heart;[1] Roger even still employs the old Toletan astronomical tables of Arzachel instead of the Alfonsine tables issued in 1252, the first year of that monarch's reign.[2] His lamentation over the sad neglect of astrology among the "Latins" is not borne out by our investigations of their interest in that subject, and indicates that he was ignorant of the work at the University of Bologna of the astrologer, Guido Bonatti, whose voluminous Latin treatise on that art based on wide reading in both classical and Arabian scholars did not indeed appear until after 1277,[3] but must have already been in preparation when Bacon wrote, since Guido was born at some time before 1223.[4] Bacon grieves at the neglect of the science of optic by his age, and says that it has not yet been lectured on at Paris nor elsewhere among the Latins except twice at Oxford;[5] he does not mention the Pole, Witelo, who traveled in Italy and whose important treatise on the subject was produced at about this time.[6]

Roger Bacon and Albertus Magnus.

While complaining of the ignorance of the natures and properties of animals, plants, and minerals which is shown by contemporary theologians in their explanation of Scriptural passages, Bacon not only slights the encyclopedias which several clergymen like Alexander Neckam, Bartholomew of England, Thomas of Cantimpré and Vincent of Beauvais had compiled; he also says nothing of the school at Cologne of Albertus Magnus, whose reputation was already established by the middle of the century, who personally investigated many animals, especially those of the north, and often rectified the erroneous assertions of classical zoologists, whom the historian of botany has lauded, whose students too were curious to know not only the theoretical botany that passed under the name of Aristotle, but also the particular characteristics of plants, and who in his five books on minerals discusses the alchemy and indulges in the same occult science and astrology which Bacon deemed so important. Yet Albert was a noted theologian and Biblical commentator as well as a student of nature.

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[1] Bacon's ignorance of Spanish would probably in any case have prevented him from securing Alfonso as a patron.

[2] Bridges, I, 192, 196, 271, 298, 299, note. Duhem, III (1915) 234, notes that in astronomical tables of 1232 for London tables for other cities are also mentioned: Paris, Marseilles, Pisa, Palermo, Constantinople, and Genoa, as well as Toledo.

[3] Since it mentions the battle of Valbona in that year.

[4] See Chapter 67.

[5] *Opus Tertium*, Brewer, 37.

[6] C. Baeumker, *Witelo, ein Philosoph und Naturforscher des XIII Jahrhunderts*, Münster, 1906. See Chapter 55, Appendix I.

In saying that Bacon does not mention Albert's work in natural science, I of course do not mean to imply that he never mentions Albert. He excuses his delay in answering the pope by declaring that the most noted Christian scholars, such as Brother Albert of the Order of Preachers, and Master William of Shyrwood, could not in ten years produce such a work as he transmits; and he incidentally observes that William is a far abler scholar than Albert.[1] I am suspicious, however, of the integrity of the passage [2] where Bacon sneers at the theological teaching of "the boys of the two Orders, such as Albert and Thomas and the others who enter the Orders when twenty years or under." It seems incongruous for Bacon to speak of his probable senior, Albert, as a boy. Other passages in Bacon's works which have been taken to apply to Albert, though he is not expressly named, seem to me not to apply to him at all closely; and if meant for him, they show that Bacon was an incompetent and unfair critic. Not only was Albert only for a short time in Paris; he does not seem to have been in sympathy with the conditions there which Bacon attacks. Nor can I see that Bacon is meant in the passage at the close of Albert's *Politics*,[3] where he declares that its doctrines, as in his books on physics, are not his own theories but a faithful reflection of peripatetic opinion; and that he makes this statement for the benefit of lazy persons who occupy their idle hours in searching writings for things to criticize; "Such men killed Socrates, drove Plato from Athens to the Academy, and, plotting even against Aristotle, forced him into exile." Such a passage seems a commonplace one. Both Adelard of Bath and William of Conches expressed the same fear of setting forth new ideas of their own, and medieval writers not infrequently in their prefaces apprehend with shrinking "the bite of envy" which both their Horace and personal experience had taught would follow fast on publication.

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[1] *Opus Tertium*, Brewer, 14.

[2] *Compendium Studii Philosophiae*, Brewer, 426.

[3] *Opera*, ed. Borgnet, VIII, 803-804, and Mandonnet, *Siger de Brabant*, p. 332.

Bacon's criticism of education applies chiefly to the training of the friars in theology.

Thirdly, while Bacon occasionally makes bitter remarks about the present state of learning in general, it is the teaching of theology at Paris and by the friars that he has most in mind and that he especially desires to reform. Though himself a friar and master of theology, he had been trained and had then himself specialized in the three learned languages, Hebrew, Greek and Arabic, in optic and geometry, in astronomy and astrology, in alchemy and "experimental science," and in the writings of the classical moralists. Consequently he thought that no one could be a thorough theologian who did not go through the same course of training; nay, it was enough to ruin the reputation of any supposed scholar in Bacon's sight, if he were unacquainted with these indispensable subjects. Bacon held that it was not sufficient preparation for theology merely to study "the common sciences, such as Latin, grammar, logic, and a part of natural philosophy, and a little metaphysics."[1] However, it was not that he objected to these studies in themselves, nor to the ordinary university instruction in the arts course; in fact, he complains that many young friars start in to study theology at once and "presume to investigate philosophy by themselves without a teacher."[2] Bacon has a low opinion of the scholarship of Alexander of Hales, because his university education had been completed before the chief authorities and commentaries in natural philosophy and metaphysics had been translated. Against another friar generally regarded by the academic world as its greatest living authority Bacon brings the charge that "he never heard philosophy in the schools," and "was not instructed nor trained in listening, reading and disputing, so that he must be ignorant of the common sciences." [1] Such passages show that to represent Bacon's writings as full of "sweeping attacks" upon "the metaphysical subtleties and verbal strifes" of his age is to exaggerate his position.[2] There are not many direct attacks upon scholastic method in his works.

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[1] *Opus Minus,* Brewer, 324.

[2] *Compendium Studii Philosophiae,* Brewer, 426. A century before John of Salisbury (*Metalogicus,* I), had written similarly: "Sed quia isti hesterni pueri, magistri hodierni, vapulantes in ferula, hodie stoleti docentes in cathedra."

His other criticisms of contemporary education.

It is true that Bacon complains of the lack of good teachers in his day, saying in the *Opus Minus* that he could impart to an apt pupil in four years all the knowledge that it had taken himself forty years to acquire,[3] and in the *Opus Tertium* that he could do it in a half or a quarter of a year, and that he could teach a good student all the Greek and Hebrew he need know in three days for each subject.[4] But aside from the young friars who presume to teach theology, the teachers against whom he rails most are those in his favorite subject of "mathematics." Bacon could teach more useful geometry in a fortnight than they do in ten or twenty years [5]—a hint that much time was given in those days to the study of mathematics. These boasts are not, however, as wild as they may at first seem; after all Roger did not know a vast amount of geometry and Greek and Hebrew, and he had no intention of teaching any more of mathematics and the languages than would be of service in his other sciences, in theology, and in practical life. He complained that "the ordinary mathematician does not consider that he knows anything unless he demonstrates it, and so he takes from thirty to forty years" to master the subject, and that "the text-books and the teachers of mathematics delight in multiplying conclusions to such an extent that one has to give years of unnecessary time to extracting the essentials," and "this is one reason why there are so few students of a science which is a prerequisite to all knowledge."[1] Nor were such boasts unique in the age in which Bacon lived. Another professor and Franciscan friar, who wrote at least no later than the early fourteenth century, Bernard of Verdun, states that his little book on astronomy takes the place of "innumerable works and huge tomes," and makes it possible for anyone acquainted with geometry to learn in a short time not only the gist of books which two years of steady reading could scarce suffice to cover, but also many points which other books omit.[2]

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[1] *Opus Minus*, Brewer, 326-327. It seems unlikely that Albert or Aquinas is meant.

[2] Bridges, I, xxx.

[3] Gasquet, 507.

[4] *Opus Tertium*, Brewer, 65.

[5] Gasquet, 507.

His personal motives.

It is easy to discern the personal motives which actuated Bacon in his criticism. He was jealous of his more successful contemporaries and desperately anxious to secure the pope as his patron. If, as Macaulay said, Francis Bacon seeking the truth was a very different person from Francis Bacon seeking the seals, we must remember that Roger Bacon combined both attempts at once. He grieved to see the neglect by his fellow theologians of the subjects in which he was particularly interested, and to see himself second in reputation, influence and advancement to the "boy theologians." It angered him that these same narrowly educated and narrow-minded men should "always teach against these sciences in their lectures, sermons and conferences."[3] And after all, as he tells the pope, he does not wish to revolutionize the curriculum nor overthrow the existing educational system, "but that from the table of the Lord, heaped with wisdom's spoils, I, poor fellow, may gather the falling crumbs I need."

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[1] The quotations are from Professor D. E. Smith's translation of Bacon's *Communia Mathematica* as contained in Digby MS 76, fol. 57 (p. 130) and fol. 56 (p. 126).

[2] From his *Tractatus optimus super totam astrologiam* as summarized in HL vol. 21, *Notices succinctes sur divers écrivains*, No. 27. Besides BN 7333 and 7334 the work is found in Amplon. Folio 393, fols. 22-43, and perhaps is the same as Amplon. Folio 386, fols. 1-25, *speculum celeste*. According to the *Histoire Littéraire* the treatise contains no judicial astrology, the word *astrologiam* being used in the meaning "astronomy" here.

[3] Gasquet, 504-505; and Bridges, I, 31; see also *Opus Tertium*, Brewer, 59.

Inaccuracy of much of his criticism.

Bacon's allusions to and dates for events in the history of medieval learning are sometimes hard to fit in with what we learn from other sources, and as we have seen he has been detected in misstatements of the doctrines of other scholars.[1] His personal diatribes against the Latin translators of Greek and Arabian science seem overdrawn and unfair, especially when he condemns the first translators for not knowing the sciences in question before they ventured to translate, whereas it is plain that the sciences could not be known to the Latin world until the translations had been made. Indeed, it may be doubted if Roger himself knew Arabic well enough to read scientific works therein without a translation or interpreter. Especially unjustifiable and ill advised seems his savage onslaught upon William of Moerbeke,[2] whom we are told Aquinas induced to translate Aristotle from the Greek, who was like Bacon interested in occult science, and to whom Witelo dedicated his treatise on optics. As William held the confidential post of papal chaplain and penitentiary under Clement IV, and as he became archbishop of Corinth about the time that Roger was condemned to prison, there may have been some personal rivalry and bitterness between them.

Bacon does not regard himself as unique.

It should be said to Bacon's credit that his own statements do not support the inference which others have drawn from them, that he was alone in the advocacy or pursuit of the studies dear to him. In the *Opus Minus* he says to the pope, with rather unusual modesty it must be admitted, "I confess that there are several men who can present to Your Wisdom in a better way than I can these very subjects of which I treat."[3] And though the secrets of the arts and sciences are neglected by the crowd of students and their masters, "God always has reserved some sages who know all the necessary elements of wisdom. Not that anyone of them knows every detail, however, nor the majority of them; but one knows one subject, another another, so that the knowledge of such sages ought to be combined." [1] Combine it Bacon does for the pope's perusal, and he is not ashamed to speak on its behalf, for though there are fewer Latins conversant with it than there should be, there are many who would gladly receive it, if they were taught.[2] Thus he speaks not merely as an exponent of his own ideas, but as the representative of a movement with a considerable following at least outside of strictly theological circles.

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[1] See page 632, note 1, and page 634, note 3.

[2] In the *Compendium Studii Philosophiae*, written about 1272 (Brewer, 472). Mandonnet, *Siger de Brabant*, 40, rejects Bacon's aspersions upon William's translations. On William's career and writings see HL XXI, 146.

[3] Gasquet, 505: "Quamvis autem fatear quod plures sunt qui hec eadem que tracto possunt meliori modo quam ego vestre sapientie referre."

Instances of ideas which were not new with him.

Bacon has been given great credit for pointing out the need of calendar revision three centuries before the papacy achieved it; but he says himself that not only wise astronomers but even ordinary *computistae* were already aware of the crying need for reform,[3] and his discussion of the calendar often coincides verbally with Grosseteste's *Computus*.[4] When Cardinal Pierre d'Ailly over a century later again urged the need of reform upon Pope John XXIII he cited Grosseteste often, but Bacon seldom or never.[5] The Parisian version of the Bible, against which Bacon inveighs as a corruption of the Vulgate, was in the first instance the work of a conscientious Hebrew scholar; [6] and the numerous corrections and changes made in it since, though deplored by Bacon, show the prevalent interest in such matters. While Bacon holds that there are very few men who understand the theory of Greek, Hebrew and Arabic grammar, or the technique of the sciences which have to be studied from those languages, he admits that many men are found among the "Latins" who can speak those tongues and that there are even plenty of teachers of Greek and Hebrew at Paris and elsewhere in France and England.[1] Thus Bacon was not so superior linguistically to his age as he has sometimes been depicted.

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[1] Gasquet, 502.

[2] *Ibid.*, 504.

[3] *Ibid.*, 515; *Opus Tertium*, Brewer, 274, 275, 295. The writer of some astronomical tables for London in 1232 complains that the calendar year and feasts of the saints are in error: Duhem, III (1915), 234.

[4] L. Baur, "Der Einfluss des Robert Grosseteste auf die Wissenschaftliche Richtung des Roger Bacon," in Little, *Essays* (1914), 45.

[5] Petrus de Alliaco, *De Correctione Kalendarii*, in an edition of the works of d'Ailly and Gerson printed about 1480.

[6] S. A. Hirsch, "Roger Bacon and Philology," in Little, *Essays* (1914), 145.

Bacon and the discovery of America.

The treatment of geography in the *Opus Maius* is simply an intelligent compilation of well-known past writers, including the wretched work of Ethicus, supplemented from writings of the friars who had recently visited the Tartars. Roger Bacon's name has sometimes been connected with the discovery of America by Columbus on the ground that Columbus was greatly influenced by the *Imago mundi* of Pierre d'Ailly and that a chapter in that work on the extent of the habitable earth was copied in large measure without acknowledgment from Roger Bacon.[2] Cardinal d'Ailly, however, can scarcely be censured for failing to mention Bacon in this context since he does cite him elsewhere and since in this passage all that he borrows from Roger are the statements of other writers whom Roger cites. That is, against Ptolemy's discouraging assertion that five-sixths of the earth's surface is covered with water he cites Aristotle, Seneca and Pliny to prove that the distance west from Spain to India is not great and the apocryphal book of Esdras to the effect that only one-seventh of the earth's surface is covered with water. But it is contended that the *Imago Mundi* was not published until 1487[3] and that Columbus did not read it until after his first voyage in 1492,[4] which is to be regarded as a continuation of the search after new islands and lands in the western ocean already undertaken by various Portuguese sailors.[1] It is interesting to note one argument for the propinquity of northwestern Africa to India employed by Bacon which d'Ailly, firm believer in astrology as he was, did not copy. Bacon argues that Aristotle and his commentator included northwestern Africa in "Spain," "since they say as proof of the narrowness of the sea between Spain and India that there are elephants only in those two places." And "Aristotle says that there cannot be elephants in those places unless they were of like complexion." [2]—i. e., under the same constellations.

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[1] *Opus Tertium,* Brewer, 34, and *Compendium Studii Philosophiae,* Brewer, 434.

[2] Bridges, I, 290, *note,* overstates the case, however, when he says: "This paragraph including half of that which follows . . . is inserted without acknowledgment . . ." etc., since much of it is omitted or condensed by d'Ailly.

[3] Rather than 1480, as stated by Bridges, *Ibid.,* and, with a query, in the British Museum Catalogue. See L. Salembier, *Pierre d'Ailly et la découverte de l'Amérique,* 1912, and his earlier works on the same subject.

[4] Only in 1494, Salembier holds, did Columbus and his brother read the *Imago mundi* together, make their 898 notes in it, and form their grand project of reaching oriental India by sailing west.

Bacon's historical attitude.

If in many respects Bacon's contribution to learning has been overestimated, there is one side of his thought which has seldom been emphasized but deserves some notice, namely, his historical attitude. In one sense history was a weak point with Bacon as with most of his contemporaries. He not only accepted the faulty accounts of the past current in his day, but was apt to pounce upon the most sensational and incredible details and use these to support his case. He had no notion of historical criticism. Unfortunately he thought that he knew a good deal about the history of philosophy, and his attitude to science is colored by his false ideas of the history of intellectual development. He of course knew nothing of evolution or of prehistoric man. For him intellectual history commenced with a complete divine revelation of philosophy to the patriarchs. Science then declined owing to the sinfulness of mankind, the invention of magic by Zoroaster, and further corruption of wisdom at the hands of Nimrod, Atlas, Prometheus, Hermes Trismegistus, Aesculapius, and Apollo. Complete knowledge and understanding were granted again by God to Solomon, after whom succeeded another period of sinful decline, until with Thales began the gradual upbuilding of

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[1] Vinaud, *Histoire critique de la grande entreprise de Colomb.* Almeida, *La découverte de l'Amérique, Extrait de la Revista de Historia,* 1913.

[2] Bridges, I, 292, "Sed Aristotelis dicit quod elephantes in illis locis esse non possunt nisi essent similis complexionis."

Greek philosophy culminating in Aristotle. Then night set in again, until Avicenna revived philosophy among the Arabs. To him and Aristotle, however, as infidels, less complete knowledge was vouchsafed than to the representatives of God's chosen people.[1] Of the composition and development of Roman law Bacon had so little notion that he thought it borrowed chiefly from Aristotle and Theophrastus, except that the Twelve Tables were derived from the laws of Solon.[2] Though he saw the value of linguistics and textual criticism, and sought with true humanistic ardor for a lost work like the *Morals* of Seneca, he accepted as genuine works of antiquity spurious treatises like the *De Vetula* ascribed to Ovid.[3] He believed that Paul had corresponded with Seneca and that Alexander's conquests were due to Aristotle's experimental science. We shall soon see how he used the astrological interpretation of history, which was the medieval counterpart of our geographical and economic interpretation. Yet Bacon deserves praise for so often opening his discussion of a problem by an inquiry into its historical background; he at least tried to adopt the historical point of view. And on the whole his historical method makes about as close an approach to modern research as do his mathematics and experimental science to their modern parallels.

His "mathematical method."

Yet the introduction of mathematical method into natural science has often been attributed to Roger Bacon, in which respect he has been favorably contrasted with Francis Bacon. Therefore it will be well to note exactly what Roger says on this point and whether his observations were notably in advance of the thought of his times. It will be recalled that in his criticism of the teaching of mathematics Roger had shown little appreciation of the labors of those pure mathematicians who devoted a lifetime to painstaking demonstration and were satisfied with nothing short of it. The discussion in the *Opus Maius* opens with strong assertions of the necessity for a knowledge of mathematics in the study of natural science and of theology as well; and we are told that neglect of mathematics for the past thirty or forty years has been the ruin of Latin learning. This position is supported by citation of various authorities and by some vague general arguments in typical scholastic style. Grammar and logic must employ music, a branch of mathematics, in prosody and persuasive periods. The categories of time, place, and quantity require mathematical knowledge for their comprehension. Mathematics must underlie other subjects because it is by nature the most elementary and the easiest to learn and the first discovered. Moreover, all our sense knowledge is received in space, in time, and quantitatively. Also the certitude of mathematics makes it desirable that other studies avail themselves of its aid.

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[1] *Opus Maius*, Bridges, I, 20, 45-56 and 65; *Opus Tertium*, Brewer, 24-25, 32.

[2] *Opus Tertium*, Brewer, 50.

[3] Pierre d'Ailly in 1410 in *De Legibus et Sectis*, cap. 4, pointed out that Bacon was relying upon a spurious work.

Its crudity.

But now we come to the application of these glittering generalities and we see what Bacon's "mathematical method" really amounts to. Briefly, it consists in expounding his physical and astronomical theories by means of simple geometrical diagrams. The atomical doctrine of Democritus cannot be true, since it involves the error that the hypothenuse is of the same length as the side of a square. Geometry satisfies Roger that there can be but one universe; otherwise we should have a vacuum left. Plato's assertion that the heavens and four elements are made up each of one group of regular solids is also subjected to geometrical scrutiny. Mathematics is further of service in Biblical geography, in sacred chronology, and in allegorical interpretation of the dimensions of the ark, temple, and tabernacle, and of various numbers which occur in Scripture. But mathematics, according to Bacon, plays its greatest rôle in astronomy or astrology and in physics, and in his favorite theory of multiplication of species or virtues, or, as modern writers have flatteringly termed it, the propagation of force.[1]

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[1] Little, *Essays* (1914), 16, quoting Adamson, *Roger Bacon: The Philosophy of Science in the Middle Ages* (1876), which is now out of print.

Its debt to others.

Astronomy and astrology had together long made up the world's supreme science; there was no originality in urging their importance, and unfortunately it was astrology rather than astronomy which seemed to Bacon by far the most important and practical part of mathematics. In physics he borrowed his discussion of weights and falling bodies from Jordanus, an earlier writer in the thirteenth century, and his optics from Alhazen and Grosseteste and from treatises which passed then under the names of Ptolemy and Euclid but were perhaps of more recent origin.[1] Bacon's graphic expression of the multiplication of species by lines and figures we find earlier in Grosseteste's *De Lineis, Angulis, et Figuris*.[2] It does not seem, therefore, that Bacon made any new suggestions of great importance concerning the application of mathematical method in the sciences, and historians of mathematics have recognized that "he contributed nothing to the pure science," [3] of whose very meaning his notion was inadequate.

III. *His Experimental Science*

Has been given undue prominence.

Let us next inquire what contributions, if any, Bacon made in the direction of modern experimental method. Jebb's edition of the *Opus Maius* in 1733 ended with the sixth part on "Experimental Science," which thus received undue prominence and seemed the climax of the work. Bridges' edition added the seventh part on "Moral Philosophy," "a science better than all the preceding," and the text as now extant, after listing various arguments for the superiority of Christianity to other religions, concludes abruptly with an eight-page devout justification and glorification of the mystery of the Eucharist.

Our preceding chapters have similarly rectified the place of Bacon's discussion of experimental science in the history of thought. We have already brought out the fact that he was not the first medieval man to advocate experimentation, but that writers before him contain "experiments," rely on experience rather than mere authority, and mention the existence of other "experimenters" and "experimental books." We have noted Petrus Hispanus' discussion of "the experimental method" (*via experimenti*), Albertus Magnus' experimental school for the study of nature, Robert Grosseteste's association of experimentation with physics, and William of Auvergne's association of experiment with natural magic. We have described experiments of Constantinus Africanus, Adelard of Bath, Pedro Alfonso, Bernard Silvester, and many others. We have yet to describe experimental books, many of which antedate Roger Bacon. His discussion will be found to do little more than duplicate and reinforce the picture of the medieval status of experimental method which we have already obtained from other and earlier sources. He is not a lone herald of the experimental method of modern science; he merely reveals and himself represents the merits and the defects of an important movement of his time.

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[1] Ptolemy's *Optics* is known only in Latin form, supposedly translated from the Arabic, edited by Govi (Turin, 1885); see Bridges, I, lxx. The *Optica* ascribed to Euclid is contained in Heiberg's edition (Leipzig, 1895).

[2] Baur, in Little, *Essays* (1914), 46-47.

[3] D. E. Smith in Little, *Essays* (1914), 171, citing Heilbronner and other historians of mathematics.

"Experimental science" distinct from other natural sciences.

Bacon's discussion of "experimental science" and of experimental method are not quite one and the same thing. He treats of "experimental science" in a separate section of the *Opus Maius,* and seems to regard it as something distinct from his other natural sciences, such as optics, alchemy, astronomy and astrology, rather than as an inductive method through regulated and purposive observation and experience to the discovery of truth, which should underlie and form an essential part of them all. Yet he also approaches the latter conception. But note that, while the sixth part on "Experimental Science" is not the last section of the *Opus Maius,* it is the last of the natural sciences to be discussed by him there rather than the first. It is not, like modern experimentation, the source but "the goal of all speculation." It is not so much an inductive method of discovering scientific truth, as it is applied science, the putting the results of the "speculative" natural sciences to the test of practical utility. "Other sciences know how to discover their first principles through experience, but reach their conclusions by arguments made from the principles so discovered. But if they require a specific and final test of their conclusions, then they ought to avail themselves of the aid of this noble science." [1] "Natural philosophy narrates and argues but does not experiment. The student of perspective and the astronomer put many things to the test of experience, but not all nor sufficiently. Hence complete experience is reserved for this science." [2] It uses the other sciences to achieve definite practical results; as a navigator orders a carpenter to build him a ship or a knight tells a smith to make him a suit of armor, so the *experimentator* uses his knowledge of geometry to construct a burning-glass or outdoes alchemy at its own specialty of gold-making.[3] In working out these practical inventions, however, the "experimenter" often happens on new facts and truths of which the speculative sciences have not dreamed, and in this way experimental science "by its own power investigates the secrets of nature." Thus Bacon begins to see the advisability of a close alliance between "experimental science" and natural science, but it is also clear that they are not yet identified. The artisans of the gilds and the alchemists—Bacon includes a discussion of alchemy in the same sixth section with his "experimental science," although in a way keeping the two distinct—seem to be engaging in this experimental science more than do the scholars of the books and schools. As William of Auvergne associated experimentation with magic rather than with science, so Bacon seems to regard natural science as largely speculative, and confirms the impression, which we have already derived from many other sources, that magicians were the first to "experiment," and that "science," originally speculative, has gradually taken over the experimental method from magic. This impression will be strengthened as we proceed to examine in more detail, first Bacon's "experimental science" and then what he has to say concerning magic. From now on, however, we shall credit Bacon with all the traces of experimental method that we can find anywhere in his writings, as well as in his separate section on "experimental science" in the *Opus Maius* and his further allusions to the same subject in the *Opus Minus* and *Opus Tertium*.

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[1] Bridges, II, 172-173; *Opus Tertium*, Brewer, 43.

[2] Little, *Part of Opus Tertium* (1912), 44.

[3] *Opus Tertium*, Brewer, 44-45.

As a criterion of truth.

Bacon not merely emphasizes the importance of experience in arriving at the truth, but of all sciences regards his "experimental science" as the best criterion of truth. "All sciences except this either merely employ arguments to prove their conclusions, like the purely speculative sciences, or have universal and imperfect experiences";[1] while "It alone, in truth, has the means of finding out to perfection what can be done by nature, what by the industry of art, what by fraud"; for it alone can distinguish what is true from what is false in "incantations, conjurations, invocations, deprecations, and sacrifices."[2]

Lack of method.

But how is one to set about experimenting? On this point Bacon is disappointing. His explanation of the rainbow, which is his longest illustration of the value of experimental science, is based merely on ordinary intelligent observation and reasoning, although he adds at the close that tests with instruments are needed and that consequently he will not assert that he has reached the full truth of the matter.[3] Elsewhere he speaks of astronomical experiments "by instruments made for this purpose," but seems to regard the unaided eyesight as sufficient for the investigation of terrestrial phenomena. Bacon has sent "over sea and to various other lands and to annual fairs, in order that I might see the things of nature with my own eyes."[1] "And those things which are not present in our locality we may know through other sages who have experienced them, just as Aristotle by authority of Alexander sent two thousand men to different regions to experience all things on the face of the earth, as Pliny testifies in his Natural History."[2] The one contemporary who most nearly fulfills Bacon's ideal of what an experimental scientist should be, does not spend his time merely in reading, attending lectures, and engaging in disputations, but "is ashamed to have some layman or old wife or knight or rustic know facts of which he is ignorant"; hence he goes out into the world and observes the doings of common workingmen and even takes hints from the operations of witches, enchanters and magicians.[3] Bacon even accepts the notion which we have already often met in other writers, that valuable medicines can be discovered by observing what remedies various animals employ. It would seem that experimental method is in a low state of its development, if it takes lessons from common human experience and from the actions of brutes. Bacon sufficiently indicates, however, that it does not consist merely of observation and casual experience, but includes purposive experimentation, and he often speaks of "experimenters." Undoubtedly he himself experimented. But the fact remains that he gives no directions concerning either the proper environment for experimenting or the proper conduct of experiments. Of laboratory equipment, of scientific instruments, of exact measurements, he has no more notion apparently than his contemporaries.

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[1] Gasquet, 510. . . . scientie omnes preter hanc vel utuntur argumentis tantum ad probationem conclusionum suarum, ut pure speculative scientie, vel habent experientias universales et imperfectas.

[2] Bridges, II, 172. Haec ergo sola novit perfecte experiri quid potest fieri per naturam, quid per artis industriam, quid per fraudem, quid volunt et somniant carmina conjurationes invocationes deprecationes sacrificia. . . .

[3] *Ibid.*, II, 201.

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[1] Gasquet, 502. Unde multotiens ego misi ultra mare et ad diversas alias regiones et ad nundinas sollemnes ut ipsas res naturales oculis viderem et probarem veritatem creature per visum. . . .

[2] Bridges, II, 169. Et quae non sunt praesentia in locis in quibus sumus, scimus per alios sapientes qui experti sunt. Sicut Aristoteles auctoritate Alexandri misit duo millia hominum per diversa loca mundi ut experirentur omnia quae sunt in superficie terrae, sicut Plinius testatur in Naturalibus.

[3] *Opus Tertium*, Brewer, 46-47. Immo verecundatur si aliquis laicus, vel vetula, vel miles, vel rusticus de rure sciat quae ipse ignorat.

Bacon and inventions.

It cannot be shown that Roger Bacon actually anticipated any of our modern inventions, nor that to him in particular were due any of the medieval inventions which revolutionized domestic life such as chimney flues and window panes, or navigation such as the rudder and mariner's compass, or public and ecclesiastical architecture such as the pointed vault and flying buttress and stained glass, or reckoning and writing such as the Hindu-Arabic numerals and paper, or reading and seeing such as lenses and eye-glasses, or warfare such as gunpowder.[1] We probably are justified, however, in accepting such passages in his works as the following, not merely as dreams that have been brought true by modern mechanical inventions, but as further indications that an interest existed in mechanical devices, and that men were already beginning to struggle with the problems which have recently been solved.

"Machines for navigation can be made without rowers so that the largest ships on rivers or seas will be moved by a single man in charge with greater velocity than if they were full of men. Also cars can be made so that without animals they will move with unbelievable rapidity; such we opine were the scythe-bearing chariots with which the men of old fought. Also flying machines can be constructed so that a man sits in the midst of the machine revolving some engine by which artificial wings are made to beat the air like a flying bird. Also a machine small in size for raising or lowering enormous weights, than which nothing is more useful in emergencies. For by a machine three fingers high and wide and of less size a man could free himself and his friends from all danger of prison and rise and descend. Also a machine can easily be made by which one man can draw a thousand to himself by violence against their wills, and attract other things in like manner. Also machines can be made for walking in the sea and rivers, even to the bottom without danger. For Alexander the Great employed such, that he might see the secrets of the deep, as Ethicus the astronomer tells. These machines were made in antiquity and they have certainly been made in our times, except possibly a flying machine which I have not seen nor do I know any one who has, but I know an expert who has thought out the way to make one. And such things can be made almost without limit, for instance, bridges across rivers without piers or other supports, and mechanisms, and unheard of engines." [1] Since Bacon's authority concerning Alexander is unreliable and his conjectures concerning ancient scythe-bearing chariots unwarranted, we may also doubt if steamboats and automobiles had "certainly been made" in his day; but men may have been trying to accomplish such things.

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[1] See Appendix II, Roger Bacon and Gunpowder.

Marvelous results expected.

Bacon says far more of the marvelous results which he expects experimental science to achieve than he does of the methods by which such results are to be attained. In the main marvelousness rather than practicability characterizes the aims which he proposes for *scientia experimentalis*. Indeed, of the three ways in which he represents it as superior to all other sciences, while one is that it employs sure proofs rather than mere arguments, two are that by it life may be greatly lengthened, and that from it a better knowledge of the future may be gained than even from astrology.[2] Thus experimental method is especially connected with alchemy and astrology. Bacon declares that "it has been proved by certain experiments" that life can be greatly prolonged "by secret experiences," [3] and he believes that Artephius was enabled by such methods to live for a thousand and twenty-five years.[4] Or experimental science may predict the weather by observing the behavior of animals.[1]

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[1] *Epistola de secretis operibus*, cap. 4, Brewer, 533. There is a similar passage in the *Communia mathematicae*, Sloane MS 2156, fol. 83.

[2] Gasquet, 510; and Bridges, *passim*.

[3] Bridges, II, 205. Praeterea certis experimentis probatum est, quod ista festinatio nimia est retardata pluries, et longaevitas prolongata per multos annos per experientias secretas.

[4] *Ibid.*, 212; Steele (1920), 23-24. For some further account of this Artephius or Artesius see the chapter on William of Auvergne, pp. 351-4.

Fantastic "experiments."

Some of Bacon's "experiments" are as fantastic as the aims are marvelous. "A good experimenter says in the book *De regimine senum*" that the following elixir will greatly prolong life: "that which is temperate in the fourth degree, and what swims in the sea, and what grows in the air, and what is cast up by the sea, and plant of India, and what is found in the entrails of an animal of long life, and those two serpents which are the food of the inhabitants of Tyre and Ethiopia." [2] We also are told that "at Paris recently there was a sage who asked for snakes and was given one and cut it into small sections except that the skin of its belly on which it crawled remained intact; and that snake crawled as best it could to a certain herb by touching which it was instantly made whole. And the experimenter collected an herb of wonderful virtue." [3]

Credulity essential.

Credulity, in contrast to the sceptical attitude of modern science is a characteristic of Bacon's experimental method. He declares, it is true, that experiment disproves many false notions such as that hot water freezes faster than cold, that adamant can be broken only with the blood of a goat, and that the beaver when hunted castrates itself to save its life;[1] but we have already heard such beliefs questioned by Albertus Magnus and others. On the other hand, Bacon asserts that credulity is necessary to experimentation. "First one should be credulous until experience follows second and reason comes third. . . . At first one should believe those who have made experiments or who have faithful testimony from others who have done so, nor should one reject the truth because he is ignorant of it and because he has no argument for it."[2] Taken as a plea for an open-minded attitude toward scientific investigation on the part of the ordinary man and of the ecclesiastical authorities, this utterance may be commended; but as a prescription for the scientific investigator it is dangerous. Many of Bacon's "experiments" are copied from books, and the reproach made against the Greek Empirics that they followed tradition, applies also to him. Describing a certain marvel of nature, he exclaims, "After I beheld this, there was nothing difficult for my mind to believe, provided it had a reliable author."[3] In the midst of his discussion of experimental science we encounter the following instance of his gullibility:

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[1] Steele (1920), p. 10.

[2] Bridges, II, 210. Et ideo dicit experimentator bonus in libro de Regimine Senum, quod si illud quod est in quarto gradu temperatum et quod natat in mari, et quod vegetatur in aere, et quod a mari projicitur, et planta Indiae, et quod est in visceribus animalis longae vitae, et duo serpentes quae sunt esca Tyrorum et Aethiopium. . . .

[3] *Ibid.*, 208. Nam Parisius nuper fuit unus sapiens, qui serpentes quaesivit et unum accepit et scidit eum in parva frusta, nisi quod pellis ventris, super quam reperet, remansit integra, et iste serpens repebat ut poterat ad herbam quandam, cuius tactu statim sanabatur. Et experimentator collegit herbam admirandae virtutis.

A Greek precursor of this tale may be found in the plot of the lost *Polyidus* of Euripides, as reproduced in Hyginus, *Fabulae*, 136. " . . . draco repente ad corpus pueri processit, quod Polyidus, aestimans eum velle consumere, gladio repente percussit et occidit. Altera serpens parem quaerens vidit eam interfectam et progressa herbam attulit atque eius tactu serpenti spiritum restituit. . . ." Polyidus then resuscitated the dead boy by the same method.

Paris continued to be a center of experimental research after Bacon, for in a Wolfenbüttel MS (2503, 15th century, fols. 271-82) we find "Experiments collected by masters of Paris that are greatly praised, and first concerning powders." The Explicit dates the collection about 1331 A. D. See also Wolfenbüttel 2189, 15th century, fols. 174-5, Quedam experimenta parisiis probata 25.

Good flying dragons.

"It is certain that Ethiopian sages have come into Italy, Spain, France, England, and those Christian lands where there are good flying dragons; and by an occult art that they possess, excite the dragons from their caves. And they have saddles and bridles ready, and they ride the dragons, and drive them at top speed through the air, in order to soften the rigidity and toughness of their flesh, just as boars, bears, and bulls are hunted with dogs and beaten with many blows before they are killed for eating. And when they have tamed the dragons in this way, they have an art of preparing their flesh . . . which they employ against the accidents of age and prolong life and inspire the intellect beyond all estimation. For no education which man can give will bestow such wisdom as does the eating of their flesh, as we have learned without deceit or doubt from men of proved trustworthiness." [1]

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[1] Bridges, II, 168-9.

[2] *Ibid.*, 202. Unde oportet primo credulitatem fieri, donec secundo sequitur experientia, ut tertio ratio comitetur. . . . Et ideo in principio debet credere his qui experti sunt, vel qui ab expertis fideliter habuerunt, nec debet reprobare veritatem propter hoc, quod eam ignorat, et quia ad eam non habet argumentum.

[3] *Ibid.*, 219. Postquam enim hoc intuitus sum, nihil fuit meo intellectui difficile ad credendum, dummodo habuit auctorem certum.

Bacon's discussion of experimental science, therefore, on its positive side amounts to little more than a recognition of experience as a criterion of truth and a promulgation of the phrase "Experimental science" which, however, he himself ascribes to Ptolemy.[2]

Experiment and magic.

On the other hand, the credulity, the superstition, the element of marvelousness, which seem to vitiate the experimental tendencies of Bacon, are to be explained as the result of a real connection between experiment and magic. There is abundant evidence for this. Bacon, it is true, asserts that experimental science exposes and shuns all the follies of the magicians, but he admits that many persons confuse it with magic because of the marvels which it works, and he himself especially associates it with the occult sciences of alchemy and astrology. It makes gold such as neither the art of alchemy nor nature can produce; it can predict the future better than astrology.[3] It teaches one to choose the proper constellations for his undertakings, and to use the right words at the proper times; [4] it can construct

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[1] Bridges, II, 211. Nam certum est quod Aethiopes sapientes venerunt in Italiam et Hispaniam et Franciam et Angliam, et in istas terras Christianorum in quibus sunt dracones boni volantes, et per artem occultam quam habent excitant dracones de cavernis suis, et habent sellas et froena in promptu, et equitant super eos et agitant in aere volatu fortissimo, ut dometur rigiditas carnium et temperetur durities, sicut apri et ursi et tauri agitantur canibus et variis percussionibus flagellantur, antequam occidantur pro comestione. Cum ergo sic domesticaverint eos, habent artem praeparandi carnes eorum . . . et utuntur eis contra accidentia senectutis, et vitam prolongant et intellectum subtiliant ultra omnem aestimationem. Nam nulla doctrina quae per hominem fieri potest tantam sapientiam inducere valet sicut esus istarum carnium, secundum quod per homines probatae fidei didicimus sine mendacio et dubitatione.

[2] Steele (1920) p. 9.

[3] Little, *Opus Tertium* (1912), 46; Gasquet, 510.

[4] Little, *Opus Tertium* (1912), 52.

"philosophical images and incantations and characters" which are vastly superior to those of magic;[1] it can alter the world about us, and incline and excite the human will, though without coercion.[2] Moreover, Bacon's ideal experimental scientist does not scorn to take hints from wizards, while Roger himself derives his hazel rod experiment from the magicians. The snake experiment of his sage at Paris sounds more like the trick of a Hindu conjurer than the procedure of a modern laboratory.

IV. *His Attitude Toward Magic and Astrology*

Magic and astrology.

Thus we are finally led to a consideration of the magic and astrology which were evidently so closely connected with Bacon's mathematics and experimental science. Roger admits a certain connection between magic and astrology, since he adopts Hugh of St. Victor's fivefold division of magic into *mantice, mathematica, sortilegium, praestigium* and *maleficium*.[3] However, except for this superstitious *mathematica* he approves of astrology, whereas his attitude towards magic is uniformly one of condemnation and contempt. We shall therefore take up his treatments of the two subjects separately.

Magic in the past.

Bacon discusses or alludes to "magic" in a number of passages scattered through his works, and to it is more particularly devoted the "Letter on the secret works of art and nature and the nullity of magic," a treatise which faithfully reproduces his point of view whether actually penned by him as it stands or not.[4] Bacon had evidently read a good deal about magic and gives a rather unusual account of its position in the Roman Empire and early Christian period, but one which is not so very far from the truth. His idea is that there were three great conflicting and contending forces in the early centuries of the Christian era, namely,

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[1] Little, *Opus Tertium*, 53.

[2] Gasquet, 510. Opera vero istius scientie quedam naturalia sunt in alterationem mundi, quedam in excitationem et inclinationem voluntatum sine coactione.

[3] Bridges, I, 240.

[4] See Appendix II for some question as to its authenticity.

Christianity, philosophy, and magic, and that each one of these was then in opposition to the other two, although there was no sufficient reason for the permanent hostility of Christianity and philosophy, which have since become allies.[1] But at the time the result was that the philosophers often accused the Christians of practicing magic, and that the early Christians similarly confused philosophers with magicians, as indeed was often done by uneducated men of the time who were not Christians. Moreover, Bacon complains that this confusion still exists in his own time and that contemporary theologians, Gratian in his work on Canon law, and "many saints" have condemned many useful and splendid sciences along with magic.[2]

Magicians and their books still prevalent.

Roger himself, however, not only regards magic as rife in antiquity, but as still prevalent in his own time. He often refers to contemporary magicians and witches, old-wives and wizards. He declares that every nation is full of their superstitions.[3] He is another medieval witness to the currency of a considerable body of occult literature, of which he speaks especially in the second and third chapters of the *Epistola de secretis operibus,* and again in his commentary on *The Secret of Secrets.* "Books of the magicians" are in circulation which are falsely attributed to Solomon and the ancient philosophers and which "assume a grand-sounding style," but which "ought all to be prohibited by law, since they abound in so many lies that one cannot distinguish the true from the false." Such works as *De officiis spirituum, De morte animae,* and *De arte notoria* embody only "figments of the magicians." Yet these books of false *mathematici* and demons, ascribed to Adam, Moses, Solomon, Aristotle, and Hermes, have seduced not only youths but mature and famous men of Bacon's own time.

Magic a delusion.

Bacon, indeed, despite the prevalence of magic both in antiquity and in his own time, regards it as essentially a delusion. It is "the nullity of magic" that he especially attempts to demonstrate both in the *Epistola de secretis operibus* and elsewhere in his works. He is medieval Christian enough, it is true, to grant that magic may perform marvels by the aid of demons.[1] But he also accepts the orthodox belief that magicians cannot coerce the demons by their invocations, sacrifices, and employment of the properties of natural objects, and that the evil spirits in reality respond only with evil intent and as God permits.[2] But his emphasis is not, like Augustine's upon the "host of wonders" which magicians work by demon aid. He seems to be sounding, not a religious retreat from magic, but a rational and scientific attack upon it. Nor does he dwell much on the criminal character of magic, although he calls the magicians *maledicti*—"of evil repute." [3] What impresses him most about magic, and the charge which he most often brings against it, is its fraud and futility. Twice he speaks of things as "false and magical"; [4] he mentions the "figments of the magicians"; [5] and associates magic and necromancy, not like Albert with astronomy, but with deception.[6] For him magicians are neither *magni* nor philosophers and astronomers; in half a dozen passages he classes them with old-wives and witches.[7] He will not admit that they employ valid natural forces. He represents magic as using sleight-of-hand, ventriloquism, subtle mechanism, darkness and confederates to simulate results which it is unable to perform.[8] He further represents the magicians as "stupidly trusting in characters and incantations," [9] and affirms that "the human voice has not that power which magicians imagine it has." [10] When words are employed in magic, "either the magician accomplishes nothing, or the devil is the author of the feat." [1] Magical incantations and formulae are made haphazard and at anyone's pleasure; they therefore possess no natural transforming power, and if they seem to effect anything, this is really the work of demons.[2] Similarly Bacon regards as worthless the assertion of the magicians and witches that sudden transformations may be produced by any man at any time of day.[3] He dismisses "fascination by word alone uttered at haphazard" as "a stupid notion characteristic of magic and of old-wives and beneath the notice of philosophers." Here again nothing is accomplished, "unless the devil because of men's sins operates unbeknownst." [4]

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[1] Bridges, I, 29, 241; *Opus Tertium,* cap. 9, Brewer 29.

[2] Bridges, I, 396.

[3] Bridges, I, 395.

[4] Brewer, 526, 531; Steele (1920), p. 6.

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[1] *Opus Tertium*, cap. 26, Brewer 99; Bridges, I, 241, 396.

[2] *Epistola de secretis operibus*, cap. 1, Brewer, 52.

[3] Bridges, I, 395 and 399.

[4] *Opus Tertium*, Brewer, 47, 95.

[5] *Epistola de secretis operibus*, Brewer, 532.

[6] Bridges, I, 262.

[7] *Ibid.*, 395-6, 398, 399; *Opus Tertium*, Brewer, 46-7, 95, 98.

[8] *Epistola de secretis operibus*, Brewer, 523.

[9] *Ibid.*, cap. 2, Brewer, 525.

[10] *Ibid.*, cap. 3, Brewer, 531.

Some truth in magic.

In certain passages, however, Bacon suggests that magic is not utterly worthless and that some truth may be derived from it. The experimental scientist whom he most admired "investigated even the *experiments* and lot-castings of old women"—note that they too were experimenters—"and their charms and those of all the magicians, and likewise the illusions and devices of all the conjurers"; and he did so not merely that he might be able to expose their deceptions, but also "so that nothing that ought to be known might escape him." [5] And his experimental science not merely "considered all the follies of the magicians, not to confirm them but to shun them, just as logic deals with sophistry"; but also "so that all falsity may be removed and the truth of the art alone retained." [6] Roger himself in the case of the split hazel rod discovered a natural phenomenon concealed by use of a magic incantation. Bacon also granted that the books of the magicians "may contain some truth." [7] It also was apparently very difficult to distinguish them from other writings, since he states that many books are reputed magical which are nothing of the sort but contain sound learning;[1] since he calls the magicians "corrupters of wisdom's records,"[2] and charges them not only with fraudulently ascribing various "enormities" to Solomon, but with misinterpreting and abusing "enigmatical writings" which he believes Solomon really wrote;[3] and since he tells us that even true philosophers have sometimes made use of meaningless incantations and characters in order to conceal their meaning. He consequently concludes that experience will show which books are good and which are bad, and that "if anyone finds the work of nature and art in one of them, let him receive it; if not, abandon the book as open to suspicion."[4]

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[1] *Opus Tertium,* cap. 26, Brewer, 96.

[2] *Ibid.,* 98-99.

[3] Bridges, I, 399.

[4] *Opus Tertium,* cap. 26, Brewer, 98.

[5] *Opus Tertium,* cap. 13, Brewer, 47, " . . . etiam experimenta vetularum et sortilegia et carmina earum et omnium magicorum consideravit et similiter omnium joculatorum illusiones et ingenia."

[6] Bridges, II, 172.

[7] *Epistola de secretis operibus,* cap. 2, Brewer, 526.

Magic and science.

Indeed, Bacon seems to think that magic has taken such a hold upon men that it can be uprooted only by scientific exposition of its tricks and by scientific achievement of even greater marvels than it professes to perform. Perhaps he realizes that religious censure or rationalistic argument is not enough to turn men from these alluring arts, but that science must show unto them yet a more excellent way, and afford scope for that laudable curiosity, that inventive and exploring instinct which magic pretends to gratify. He waxes enthusiastic over "the secret works of art and nature," and contends that the wonders of nature and the possibilities of applied science far outshine the feats of magicians.[5] One reason why early Christian writers so often confounded philosophy and magic together was, in his opinion, that the philosophers by their marvelous exploitation of the forces of nature equalled both the illusions of magic and the miracles of the Christians.[6] Science, in short, not merely attacks magic's front; it can turn its flank and cut it off from its base of supplies.

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[1] *Epistola de secretis operibus*, cap. 3, Brewer, 532.

[2] Bridges, I, 394.

[3] Bridges, I, 392.

[4] Brewer, 532.

[5] *Epistola de secretis operibus*, Brewer, 352-357.

[6] Bridges, I, 29, 241; *Opus Tertium*, cap. 9, Brewer, 29.

His belief in marvelous "extraneous virtues."

But Bacon's science is sometimes occult science. In the first place he shared the common belief of his time that "herbs and stones and metals and other things" possess "almost miraculous" powers.[1] By thorough investigation of such occult virtues Artephius prolonged his existence to one thousand and twenty-five years. "Moreover, there are numerous things which kill every venomous animal by the slightest contact; and if a circle is drawn about such animals with objects of this sort, they cannot get out but die without having been touched. And if a man is stung by a venomous animal, he can be cured by a little powder scraped from such objects, as Bede writes in his *Ecclesiastical History* and as we know by experience. And so there are innumerable things which have extraneous virtues of this sort, of whose powers we are ignorant from mere neglect of experimentation." [2] By calling such virtues "extraneous" Bacon seems to imply that they cannot be accounted for by the properties of the elements composing the objects, and perhaps further that they are of celestial origin. This points on to his belief in astrology.

Non-magical fascination.

But Bacon goes farther than that, for some of his "secret works of art and nature" we must regard as plain cases of magic procedure, and they would indeed be so classified by most of our authors. Bacon really goes about as far as Albertus Magnus in credulous acceptance of superstition, but will not admit, as Albert does, that such things are magic or very closely related to it. The incantations and characters, the fascination and marvelous transformations of magic Bacon condemns, but he does not condemn all incantations and characters, nor disbelieve in marvelous transformations and fascination. While he regards haphazard fascination as magic, he holds that just as certain bodily diseases are contagious, so if some malignant soul thinks hard of infecting another, and desires this ardently, and has full confidence in its own power to inflict such injury, "there is no doubt that nature will obey thought, as Avicenna"—who seems to have been the leading medieval authority on the subject of fascination—"shows in his eighth book on animals and in his fourth book on the soul: . . . and this much is not magic." [1]

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[1] Bridges, II, 208, "Et ideo insidiati sunt animalibus brutis ut scirent vires herbarum et lapidum et metallorum et aliarum rerum, quibus sua corpora rectificabant multis modis tanquam miraculosis."

[2] Bridges, II, 218.

The power of words.

Bacon makes a close connection between fascination and the power of words and of the human voice, since in his opinion both are largely due to the rational soul. Words are the soul's most appropriate instrument and almost every miracle since the beginning of the world has been performed by using them.[2] "For where the attention, desire and virtue of the rational soul, which is worthier than the stars, concur with the power of the sky, it is inevitable that either a word or some other instrument of marvelous power be produced which will alter the things of this world, so that not only natural objects but also souls will be inclined to those ends which the wise operator desires." [3] Again in the *Opus Tertium* we are told that, while the magician accomplishes nothing by words, the wise man may for this reason. "When words are uttered with deep thought and great desire and good intention and firm confidence, they have great virtue. For when these four qualities unite, the substance of the rational being is strongly excited to radiate its own species and virtues from itself into its own body and foreign matter." [4] The rational soul influences the voice, which in turn affects the atmosphere and all objects contained therein. The physical constitution of the speaker also has some influence, and finally the positions of the stars must by all means be taken into account.[5] All this reasoning is equivalent to accepting the power of incantations, for as Bacon states, "They are words brought forth by the exertion of the rational soul, and receive the virtue of the sky as they are pronounced." [6]

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[1] Bridges, I, 398.

[2] *Idem,* and *Opus Tertium,* cap. 26, Brewer, 96.

[3] Bridges, I, 395.

[4] Brewer, 96.

[5] *Ibid.*

[6] Bridges, I, 395. "Carmina sunt verba ex intentione animae rationalis prolata, virtutem coeli in ipsa pronunciatione recipientia;

Through their power bodies are healed, venomous animals put to flight, and other such effects produced. If incantations are made as described above, "then they are philosophical and the work of a sage wisely enchanting, as David the prophet says."[1] Bacon, however, recognizes that he is dealing with a delicate matter in which it is hard to distinguish between philosophy and magic.[2] Of his further discussion of characters and images, and effort to show that they need not be magical, we shall treat presently in connection with his astrology. In his introduction to *The Secret of Secrets* he holds that the prayers and sacrifices of Aristotle and other philosophers were licit and not idolatrous.[3]

Magic and science again.

Thus Bacon fails in his attempt to draw the line between science and magic, and shows, as William of Auvergne, Albertus Magnus, and others have already shown, how inextricably the two subjects were intertwined in his time. His own science still clings to many occult and magical theories and practices, while he admits that the magicians often try or pretend to use scientific books and methods, and that it is no easy matter to tell which books and characters and images are which. The experimental scientist not only exposes the frauds of magic but discovers secrets of nature hidden beneath the husk of magical ceremony and pretense. Also some men employ the marvels of philosophy for wicked ends and so pervert it into a sort of magic. Finally in one passage he forgets himself and speaks of "those magnificent sciences" which properly employ "images, characters, charms, prayers, and deprecations" as "magical sciences."[4]

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unde de mira potestate literarum ego facio mentionem in tertia parte. Per hanc enim potestatem sanantur corpora, fugantur animalia venenosa, advocantur ad manum bruta quaecunque. . . ."

[1] *Opus Tert.*, cap. 26, Brewer, 99. "Si vero fiunt secundum species et conditiones dictas, tunc sunt philosophica et sapientis incantantis sapienter; ut recitat David propheta."

[2] *Epistola de secretis operibus*, cap. 3, Brewer, 531. "Et ideo valde caute in his sentiendum est; nam de facili potest homo errare, et multi errant in utramque partem; quia aliqui omnem operationem negant, et alii superfluunt, et ad magica declinant."

[3] Steele (1920), p. 8.

[4] Little, *Part or the Opus Tertium* (1912), 17-18: "Et ideo si ecclesia de studio ordinaret, pos-

The multiplication of species.

Bacon's doctrine of the multiplication of species is a good illustration of the combination of magic and science which we encounter in his works. This theory has been praised by his admirers as the propagation of force subject to mathematical law; and he has been commended for describing the species which every agent causes in all directions not, like the idols of Lucretius, as material films which peel off from the agent and impress themselves on surrounding matter, but as successive effects produced in that matter. Bacon usually illustrates his theory by the radiation of light from the sun, and by a discussion of the geometrical laws of reflection and refraction; thus his theory seems at first sight a physical one. He believed, however, that the occult influences of the planets upon nature and man were exercised in the same way, and also such mysterious powers as those of the evil eye and of fascination. Indeed, he asserts that this multiplication of virtues is universal, and that spiritual beings as well as corporeal objects affect in this manner everything about them and may themselves be so affected by other objects and beings.[1] Viewed from this angle, his theory seems a magical one of occult influence, though given a scientific guise by its assumption that such forces proceed along mathematical lines after the analogy of rays of light. This suggests that it is not fair merely to call Bacon's science superstitious; we must also note that he tries to make his magic scientific. But finally we must note that this doctrine was not original with Bacon; we have already met with it in Alkindi's work on stellar rays.[2]

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sent homines boni et sancti laborare in hujusmodi scientiis magicis auctoritate summi pontificis speciali."

[1] Bridges, I, 111: "Omne enim efficiens agit per suam virtutem quam facit in materiam subjectam, ut lux solis facit suam virtutem in aere, quae est lumen diffusum per totum mundum a luce solari. Et haec virtus vocatur similitudo, et imago, et species, et multis nominibus, et hanc facit tam substantia quam accidens, et tam spiritualis quam corporalis. Et substantia plus quam accidens, et spiritualis plus quam corporalis. Et haec species facit omnem operationem hujus mundi; nam operatur in sensum, in intellectum, et in totam mundi materiam pro rerum generatione."

[2] An interesting instance of its survival in the fifteenth century and of the fact that Roger Bacon was not the only medieval clergy-

William of St. Cloud on works of art and nature compared to magic.

It is interesting to find Bacon's belief that the works of art and nature can exceed those of magic, and his charge that unscientific persons are confusing such works with magic, repeated by another writer. William of St. Cloud composed astronomical tables based upon his own observations during the period from about 1285 to 1321, in which he detected errors in the earlier tables of Thebit, Toulouse, and Toledo. This experimental astronomer, speaking of the powers of mirrors and lenses, such as those of Archimedes, those by which Caesar saw Britain from the shores of Gaul, and that by which Socrates discovered a dragon in the air, says: "These marvels and many others have been performed in ancient times, not by magic art, as some would have it, who are ignorant of the secrets of nature and of scientific industry, but solely by the force of nature and the aid of art." [1]

The two mathematics.

We now turn to Bacon's attitude towards astrology, which we have already seen was an important factor in his "secret works of art and nature" as well as in his mathematics. He was aware that the *mathematici* or astrologers of the Roman Empire had been condemned by some of the church fathers, and were classed as practitioners of magic by more recent theologians and writers on Canon law. Like Isidore, Albertus Magnus, and other authors whom we have already discussed, Bacon gets around this by distinguishing two varieties of mathematics, one of which he says is magic, condemned by Cicero in his *De divinatione* and by other classical authorities as well as by the church fathers, the other a department of philosophy, a branch of which Augustine, Ambrose, Basil, Cassiodorus, and Gregory all approved. In

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man interested in astrological medicine, is provided by the treatise of an archdeacon of Parma and doctor of medicine on "The domination and projection of rays," preserved in a Wolfenbüttel MS: 2816, fols. 186-200, "Explicit tractatus de denominatione et proiectione radiorum magistri Mattaei de Guarimbertis de Parma, archydiaconi Parmensis, artium et medicine doctoris, egregie, finitus in Burgo in Brecya in domo magistri Petri Herlensis, in artibus et medicina eximii professoris, anno Domini 1461 incompleto ante carnisprivium per me Jacobum de Huerne."

[1] William's writings exist in manuscript in the Bibliothèque Nationale, and are described HL 25: 64 ff.

the *Opus Maius* and *Opus Tertium* he states as usual that the "e" is long in the magical art of divination, while the vowel is short in the philosophical study; but in other writings he changed his mind and declared that "all the Latins" were wrong in this opinion and that the distinction was just the opposite.[1] Bacon also cites Isidore's distinction between two kinds of "astronomy"; one natural science, the other superstitious. Roger himself sometimes uses the words "astrology" and "astronomy" indifferently; sometimes speaks of "astrology" as speculative and "astronomy" as practical; sometimes distinguishes between speculative and practical astrology, of which the last includes judicial astrology.[2]

Four objections to the forbidden variety.

Four features, to Bacon's mind, distinguish the forbidden *mathematica* from legitimate judicial astrology.[3] In the first place, it ascribes fatal necessity to the influence of the stars, whereas Bacon shows by an examination of the writings of Haly, Ptolemy, Avicenna, Messahala, and Isaac that learned and legitimate astrologers have never held any such tenet as fatal necessity, although common report may ignorantly ascribe such doctrine to them.[4] In the second place, the practitioners of the magical variety of mathematics "invoke demons by conjurations and sacrifices to supplement the influence of the constellations, an execrable practice." Third, "they mar their astrological observations by the idlest sort of circles, figures, and characters, and by the stupidest incantations and unreasonable prayers in which they put their trust." Finally they often resort to fraud, employing confederates, darkness, deceptive mechanisms, and sleight-of-hand. By such methods "in which they know there is illusion" and "in which there is no virtue of the sky operating," "they perform many feats which seem marvelous to the stupid." [5]

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[1] *Opus Tertium,* cap. 9 (Brewer, 27); Bridges, I, 239 and note, giving passages from Bacon's unpublished writings, also I, 240 and 247. Steele (1920), pp. viii, 3.

[2] *Opus Tertium,* caps. 9, 30 (Brewer, 27, 106); Bridges, I, 109, 242 note.

[3] Bridges, I, 241.

[4] *Ibid.,* 242-45.

[5] *Ibid.,* I, 241. ". . . mathematici isti daemones advocant in adiutorium coelestium dispositionum per coniurationes et sacrificia,

The rule of the stars.

While thus censuring the *mathematica* which is a subdivision of magic, Bacon declared that "it is manifest to everyone that the celestial bodies are the causes of generation and corruption in all inferior things." [1] Had not Aristotle in his treatise on Generation and Corruption said that the four terrestrial elements are related to the heavens as tools to an artificer? [2] Bacon regarded the stars as ungenerated, incorruptible, and voluntary in their movements, which were regulated by angelic intelligences.[3] He also accepted the usual technique of the astrological art in explaining the operation of this celestial influence.[4]

Astrological medicine.

Bacon naturally subjected the human body to the constellations and was a firm believer in astrological medicine. If a doctor is ignorant of "astronomy," his medical treatment will be dependent upon "chance and fortune." [5] Bacon holds not only that at conception and at birth one's fundamental "complexion," or physical constitution, is determined by the sky,[6] but that with each changing hour our bodies are governed by a different planet whose characteristics the physician should know. Where Neckam [7] had assigned six hours to the planet after which the day was named, that is, the first three and last three hours of the twenty-four, Bacon assigns it only four hours, namely, the first, eighth, fifteenth and twenty-second. Then, in order to bring the proper planet into control of the first hour of the succeeding day,

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quod est omnino nefandum; atque nihilominus maculant suas considerationes in coelestibus per circulos et figuras et characteres vanissimos et carmina stultissima et orationes irrationabiles in quibus confidunt. Praeterea fraudes operum adiungunt, scilicet per consensum, per tenebras, per instrumenta sophistica, per subtilitatem motionis manualis, in quibus sciunt illusionem esse, et multa stultis miranda faciunt per haec in quibus virtus coeli nihil operatur. . . ."

[1] *Opus Tertium*, cap. 30, Brewer, 107. "Coelestia sunt causae generationis et corruptionis omnium rerum inferiorum, ut manifestum est cuilibet." See also *Opus Tertium*, cap. 11, and Bridges, I, 110.

[2] Bridges, I, 379.

[3] Steele, I, 12; III, 228-39; Bridges, II, 450.

[4] Astrology is discussed by Bacon in Bridges, I, 138-148, 238-269, and 376-404; Gasquet, 512-516; *Opus Tertium*, Brewer, 105-106, 271-272; *Opus Minus*, Brewer, 320-321; *Compendium Studii Philosophiae*, Brewer, 421-422; Little, Part of the *Opus Tertium*, 1-19; Steele (1920), 1-24; and in many scattered passages.

[5] Gasquet, 516.

[6] Bridges, I, 396.

[7] See p. 202.

he is obliged to have them follow each other in a different order in their rule of hours from that in which the days of the week are named.[1] Bacon also distributes the parts of the body among the signs of the zodiac,[2] and states that the physician must observe the moon carefully.[3] He cites Hippocrates, Galen, the *Centiloquium* and Haly concerning the great influence of the stars both upon health and the administering of medicines.[4] That the patriarchs of the Old Testament lived so much longer than men do to-day has been explained by many, Bacon says, as due to the stars. His explanation of the strange case of a woman of Norwich who ate nothing for twenty years and yet was during all that time in the best of health is that some constellation must have reduced the concourse of the four elements in her body to a self-sufficient harmony such as they seldom attain.[5] Indeed, he goes so far as to hold that the resurrected body will have that harmony of the elements and so endure through eternity, no matter whether raised to the bliss of heaven or subjected to the consuming torments of hell.

Influence of the stars upon human conduct.

Bacon even held that the stars by their influence upon the human body incline men to bad acts and evil arts or to good conduct and useful sciences. Such natural inclinations might, however, be resisted by effort of will, modified by divine grace, or strengthened by diabolic tempting.[6] But while the individual by an effort of will may resist the force of the stars, in masses of men the power of the constellations usually prevails; and the differences in peoples inhabiting different parts of the earth are due to their being under different aspects of the sky. Recent bloody wars might have been avoided, had men harkened to warnings written in the sky.

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[1] Bridges, I, 382.

[2] *Ibid.*, I, 381.

[3] *Ibid.*, I, 384.

[4] *Ibid.*, I, 386-7.

[5] *Opus Minus*, Brewer, 373-4. "Aliqui diu vixerunt sine nutrimento, ut nostris temporibus fuit una mulier in Anglia in diocesi Norwicensi quae non commedit per XX annos et fuit pinguis et in bono statu nullam superfluitatem emittens de corpore, sicut probavit episcopus per fidelem examinationem. Nec fuit miraculum sed opus naturae, nam aliqua constellatio fuit illo tempore potens elementa reducere ad gradum aequalitatis propinquiorem quam ante fuerunt. . . ."

[6] Bridges, I, 138-39.

"Oh, how great profit to the church of God might have been procured, if the disposition of the sky for those times had been foreseen by the wise, and known to prelates and princes, and restricted by zeal for peace! Then there would not have been such slaughter of Christians nor so many souls sent below."[1] The personality of the king, too, has such great influence upon his kingdom that it is worth while to examine his horoscope carefully.[2]

Planetary conjunctions and religious movements.

Bacon was especially attracted by the doctrine of Albumasar concerning conjunctions of the planets, and derived comforting evidence of the superiority of the Christian faith to other religions from the astrological explanation of the origin of religious sects according to the successive conjunctions of the other planets with Jupiter.[3] He was pleased by the association of Christianity with Mercury, which he calls the lord of wisdom and eloquence, of oracles and prophecies; it is dominant only in the sign Virgo, which at once suggests the Virgin Mary; and its orbit, difficult to trace because of epicycle and eccentric, typifies well the Christian creed with its mysteries that defy reason. Similarly the malign force of the moon, productive of necromancy and magic, fits Antichrist exactly; and Venus corresponds to the sensuality of Mohammedanism. Further astrological evidences of Christianity are the coincidence six years before the birth of Christ of an important conjunction of Saturn and Jupiter with a tenth revolution of Saturn, which last occurs only at intervals of 320 years, and always marks some great historical change like the advent of Alexander or Manes or Mohammed. Astrology further assures us that Islam can endure only 693 years, a prediction in close agreement with the number of the beast in the Apocalypse, 663 (*sic*); the small discrepancy of thirty years is readily accounted for by the dictum of the venerable Bede that

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[1] Bridges, I, 386.

[2] *Ibid.*, 253.

[3] Both this doctrine and Albumasar's reference to the birth of Jesus are given in Steele, *Opera hactenus inedita*, fasc. I, 42-50 and 8-9, as well as in the passages listed in note 4, p. 670.

"Scripture in many places subtracts something from the complete number, for that's the way with Scripture." [1]

Was Christ born under the stars?

The astronomers, Bacon tells the pope, further assure us that even the Virgin Birth of Christ and His Nativity were in accordance with the constellations. They think that God willed so to order His works that certain future events which He foresaw or predestined should be revealed to the wise through the planets, in order that the human mind, recognizing God's marvelous works, might increase in love towards Him. They grant that it is impossible that the Creator be subject to a creature, or that the birth of Christ, in so far as it was supernatural, should be subject in any way to the influence of the stars, which in this respect could only be signs of the divine work. But in so far as the birth of Jesus was a natural event and His nature was human, they regard Him as under the influence of the constellations, like the rest of humanity. Their statements in such matters should, however, Bacon more cautiously adds, be brought into conformity with the doctrines of the Catholic faith.[2]

Operative astrology.

Bacon believed that by means of astrology not only could the future be in large measure foretold, but also marvelous operations and great alterations could be effected throughout the whole world, especially by choosing favorable hours and by employing astronomical amulets and characters—in other words, by the arts of elections and of images.[3] As the babe at birth receives from the stars that fundamental physical constitution which lasts it through life, so any new-made object is permanently affected by the disposition of the constellations at the moment of its making.[4] Especially by images, "if they are engraved in accordance with the aspect of the sky in the elect times, can all injuries be repelled and useful undertakings promoted." [5] Bacon not only cites as authorities concerning them Haly's commentary on the *Centiloquium* supposed to be by Ptolemy, Thabit ben Corra, and the spurious *Secret of Secrets* of Aristotle; but believes that Moses and Solomon both made use of them.[1] The marvelous power of spoken words is also in part accounted for by Bacon by the celestial influence prevalent at the moment of utterance. "Although the efficacious employment of words is primarily the function of the rational soul," nevertheless "the astronomer can form words in elect times which will possess unspeakable power" of transforming natural objects and even inclining human minds to obey him.[2] Thus Bacon's "astronomer" is really a magician and enchanter as well—one more of the many indications we have met that there is no dividing line between magic and astrology: divination is magic; astrology operates. Bacon was very desirous that the church should avail itself of the guidance and aid of astrology; and he feared the harm that Antichrist, whose advent Bacon with many others of his century seems to have believed was near at hand, or the Tartars with their astrologers, would be able to do Christendom, if the church neglected this art.[3]

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[1] Bridges, I, 266: "Et huic sententiae concordat apocalypsis xiii capitulo. Nam dicit quo numerus bestiae est 663, qui numerus est minor praedicto per xxx annos. Sed scriptura in multis locis subticet aliquid de numero completo, nam hic est mos scripturae ut dicit Beda."

[2] Bridges, I, 267-68.

[3] Brewer, 107, 526-27; Bridges, I, 390 ff.

[4] Bridges, I, 396.

[5] Bridges, I, 394.

Unlikelihood that Bacon was condemned for magic or astrology.

Having considered Bacon's position in regard to magic and astrology, we are now prepared to inquire what likelihood there is that his reported condemnation in 1278 for "some suspected novelties" was due to either. Briefly it may be answered to begin with that his views concerning these subjects were not novel; he shared them with Albert and other contemporaries, and there seems to be no good reason why they should have got him into trouble. His expressed attitude towards "magic" is so hostile that it seems unlikely that he would have been charged with it, when other clergymen like Albert and William of Auvergne spoke of it with less hostility and yet escaped unscathed. There is not a particle of evidence in his works that he ever invoked spirits or attempted to do anyone an injury by occult methods, and this was the only kind of magic that was likely to be punished at that time.[1] Towards astrology he was, it is true, more favorable than some of his contemporaries. With his views on astrological images and his attribution of religious sects to conjunctions of the planets theologians like Aquinas and William of Auvergne would refuse to agree, but Arabian astrology supported such doctrines, and the views of an approved Christian thinker like Albertus Magnus concerning astrology are almost identical with those of Bacon. We note elsewhere writings on such subjects as astrological medicine by Franciscans; and such a regulation as that of May 25, 1292, for Franciscans studying at Paris, that they should not spend the alms given them to buy books with for other purposes, nor cause curious books to be made, suggests that a number of them were prone to consult superstitious works as well as that the Order forbids this.[2] And by "curious books" are doubtless meant the sort that we have heard Bacon strongly censure.

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[1] Bridges, I, 392-94. He cites Josephus's *Antiquities* as his authority for the employment of such images by Moses.

[2] *Ibid.*, 395; *Opus Tertium*, Brewer, 96-99.

[3] Bridges, I, 399-403. See Marco Polo, I, 61 and II, 33, concerning the "crafty enchanters and astrologers" in the train of the Great Khan and the five thousand astrologers and soothsayers in Peking.

Error of Charles in thinking that any stigma rested on Bacon's memory.

Again therefore there is no reason why Bacon should have been singled out for condemnation. Such a notion has arisen partly from misapprehension as to the views of Bacon's contemporaries and from misstatements such as the passage in Charles' life of Bacon,[3] where he declares that Cardinal Pierre d'Ailly in his treatise on laws and sects condemns the doctrine of an English doctor concerning religions and the conjunctions of planets, and approves the contrary doctrine of William of Auvergne, but "does not dare" to name Bacon, to whom he alludes with the bated breath of terror and repugnance. All this, except the bare fact that d'Ailly criticizes this particular doctrine of Bacon, is sheer fancy on Charles' part. Had he consulted a complete fifteenth-century edition of d'Ailly's writings instead of merely such of his treatises as were included in an eighteenth-century edition of the works of Gerson, he would have known that elsewhere the cardinal cites Bacon on astrology by name with respect and admiration,[1] and that the learned reformer even goes so far as to agree boldly and explicitly with Bacon's doctrine that Christ as a son of man was under the stars.[2] That Bacon's astrology had not been condemned in 1278 is also indicated soon after his death by Pierre Dubois' approving mention of his discussion of the utility of "mathematics." [3]

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[1] A good contemporary illustration is had in the charges brought against Hubert de Burgh by Henry III: " . . . he had stolen from Henry and given to the prince of Wales" (even Stubbs nods!) "a talisman which rendered its wearer invulnerable; . . . he had poisoned the earl of Salisbury, the young earl Marshall, Falkes de Breauté, and Archbishop Richard; he had kept the king under his influence by witchcraft": Stubbs, *Constitutional History of England,* 1906, II, 45-46, citing Matthew Paris, III, 221-3. Thus Hubert was accused of theft, poisoning, and sorcery. But there was nothing wrong in possessing such a magic talisman.

[2] *Chartularium Universitatis Parisiensis,* II, 56-7, " . . . et caveant ne elemosinas sibi missas pro libris in alios usùs commutent, nec libros fieri faciant curiosos."

[3] P. 49.

But his own statements may have caused the legend.

It must be added, however, that there are passages in Bacon's own writings which are perhaps also partly responsible for the growth of the idea that he was condemned for magic or astrology. Briefly, these are the passages where he himself says that there is danger of scientists being accused of magic. For instance, he tells us that "scarcely anyone has dared" to speak of astronomical images in public, "For those who are acquainted with them are immediately called magicians, although really they are the wisest men." [4] It also seems somewhat strange that Bacon should always be so condemnatory and contemptuous in his allusions to magic and magicians, when both William of Auvergne and

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[1] In his *Apologetica Defensio Astronomice Veritatis* he cites "Bacon magnus doctor anglicus in epistola ad Clementem papam"; in his *Alia Secunda Apologetica Defensio eiusdem,* arguing that the superstitution of certain astrologers does not invalidate the art, he says, "Et hoc pulcre et diffuse probat Bacon in epistola ad papam Clementem"; and in his *Elucidarius* he definitely says that it was Bacon whose theory of conjunctions and sects he discussed in the *De Legibus et Sectis.*

[2] In the *Apologetica Defensio* and again in the *Vigintiloquium.*

[3] *De Recuperatione Terre Sancte* (ed. C. V. Langlois, Paris, 1891), 65.

[4] Bridges, I, 394. "Statim enim vocantur magici, cum tamen sint sapientissimi qui haec sciunt."

Albertus Magnus allude to it as sometimes bordering upon science, in which case they do not regard it unfavorably. The suspicion occurs to one that Bacon perhaps protests a little too much, that he is condemning magic from a fear that he may be accused of it. But are not his apprehensions exaggerated? Does he not overstate the hostility of canonists and theologians to his many splendid sciences, and their tendency to confuse them with magic? Thomas of Cantimpré in the *De natura rerum* and Albert in the treatise on minerals and in the *Speculum astronomiae* dared to discuss astronomical images. And finally, whether there is any real ground for Bacon's apprehensions or not, if he is afraid of being accused of magic, would not this very fear keep him from going too far and from thereby incurring condemnation in 1278 on this account?

V. *Conclusion*

Characteristics of medieval books.

Such were Roger Bacon's views bearing upon magic and experimental science and their relations to Christian thought, as set forth principally in his *Opus Maius* and the two other treatises to the pope which supplemented it. Most medieval books impress one as literary mosaics where the method of arrangement may be new but most of the fragments are familiar. One soon recognizes, however, that striking similarity in two passages is no sure sign that one is copied from the other. The authors may have used the same Arabic sources or simply be repeating some commonplace thought of the times. Men began with the same assumptions and general notions, read the same limited library, reasoned by common methods, and naturally often reached the same conclusions, especially since the field of knowledge was not yet so extensive but that one man might try to cover it all, and since all used the same medium of thought, the Latin language. New discoveries were being made occasionally but slowly, perhaps also sporadically and empirically. A collection of industrial and chemical recipes in the thirteenth century may in the main be derived from a set of the seventh century or Hellenistic age, but a few new ones have somehow got added to the list in the interim. Thomas of Cantimpré's encyclopedia professes to be no more than a compilation, but it seems to contain the first allusion we have to modern plumbing.

Features of Bacon's *Opus Maius.*

Bacon's chief book was a mosaic like the rest, but bears a strong impress of his personality. Sometimes there is too much personality, but if we allow for this, we find it a valuable, though not a complete nor perfect, picture of medieval learning. Its ideas were not brand-new; it was not centuries in advance of its age; but while its contents may be found scattered in many other places, they will scarcely be found altogether anywhere else, for it combines the most diverse features. In the first place it is a "pious" production, if I may employ that adjective in a somewhat objectionable colloquial sense to indicate roughly a combination of religious, theological, and moral points of view. In other words, Bacon continues the Christian attitude of patristic literature to a certain extent; and his book is written by a clergyman for clergymen, and in order to promote the welfare of the Church and Christianity. There is no denying that, hail him as one may as a herald of modern science. Secondly, he is frequently scholastic and metaphysical; yet thirdly, is critical in numerous respects; and fourthly, insists on practical utility as a standard by which science and philosophy must be judged. Finally, he is an exponent of the aims and methods of what we have called "the natural magic and experimental school," and as such he sometimes comes near to being scientific. So there is no other book quite like the *Opus Maius* in the Middle Ages, nor has there been one like it since; yet it is true to its age and is still readable to-day. It will therefore always remain one of the most remarkable books of the remarkable thirteenth century.

APPENDIX I

THE STUDY OF ROGER BACON

Lack of early printed editions of his works.

In addition to criticizing and refuting the over-estimate of Roger Bacon which has been prevalent in modern times, it may be well to indicate when and how this exaggerated estimate of his importance and uniqueness originated, and also to trace the gradual growth of a more critical attitude towards him in still more recent years. The investigations of Mr. A. G. Little and several other contributors to the *Roger Bacon Essays* of 1914 have demonstrated that his writings were not almost forgotten for centuries, but that they exerted a continuous influence. However, owing perhaps to the unfinished state and rather fragmentary, confused, and scattered form in which they have survived in the manuscripts, they did not appear, as did many of the works of medieval science which we have considered, immediately after the invention of printing in early editions. No incunabula of them are known and only a few brief treatises were printed in the course of the sixteenth century,[1] namely, some alchemistic tracts of doubtful authorship, a treatise on how to postpone the ills of old age, and the "Epistle concerning the secret works of nature and the nullity of magic," which became quite a favorite and was reprinted several times in Latin and appeared twice both in English and in French translations in the course of the seventeenth century.[2]

His popular reputation as a magician.

Meanwhile, despite what was said of "the nullity of magic" in this treatise on the secret works of nature,[3] Friar

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[1] See Little's lists of Bacon's writings in the Appendix to the *Roger Bacon Essays*.

[2] *Ibid.*, 396.

[3] Or perhaps because of it, since "The famous historie of Fryer Bacon" in prose takes two chapters word for word from the English translation of "The Epistle concerning the secret works of nature and the nullity of magic"—see Sandys, p. 365 in Little, *Essays*.

Bacon had become in popular tradition a nigromancer, conjurer, and magician. As such he was presented about 1592 in Robert Greene's play, the "Honourable History of Frier Bacon and Frier Bungay," with magic wand, perspective glass, and speaking brazen head, and in the prose "Famous Historie of Fryer Bacon" which appeared about the same time.[1] In 1625 Naudé included Roger Bacon among the great men of the past whose memory he endeavored to clear of the false charge of magic.[2]

Jebb's edition of the *Opus Maius.*

Other medical and alchemistic tracts by Bacon were issued together in 1603,[3] and some portions of his chief work, the *Opus Maius,* and other similar fragments dealing with mathematics and optics were published in 1614.[4] But the *Opus Maius* itself remained unprinted until 1733, when Jebb issued his edition of the work upon which Bacon's fame has since largely rested. This edition,[5] although to-day become quite rare, was perhaps just late enough not to share the neglect which with the advance of modern science befell the numerous earlier editions of medieval physicians, alchemists, astrologers, and natural scientists. On the other hand it was perhaps just early enough to introduce Roger and his criticisms of the learning of his contemporaries to an age whose historical interests were largely dominated by classicism. And when interest in and study of the middle ages developed in the course of the nineteenth century, for a time it had the effect of only increasing the exaggerated emphasis laid upon Roger Bacon.

General misestimate of Bacon and of medieval science.

As a result it came to be the fashion in works tracing the history of this or that department of learning from the times of the ancient Greeks or Egyptians to our own, in gliding rapidly and at a lofty height over the generally unexplored medieval region, and airily dropping a few bombs concerning the blighting effect of the church upon freedom of thought and scientific investigation or anent the inanities of scholasticism, to exclaim at the marvelous apparition of a mind like Roger Bacon's in such an age and to hail him as a herald of a later and better civilization. There was the more excuse for doing this, since Jebb's version of the *Opus Maius* had terminated the text with the sixth part on "Experimental Science." [1] This theme thus appeared to be the climax of the work, and the impression was given that Roger Bacon was primarily a natural scientist and that he regarded experimental method as the supreme thing in the study of nature. Consequently he came to be regarded by many as the first rebel against scholasticism and the first prophet of modern science.

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[1] See J. E. Sandys, "Roger Bacon in English Literature," in Little, *Essays.*

[2] Gabriel Naudé, *Apologie pour tous les grands personages qui ont esté faussement soupçonnez de Magie,* Paris, 1625.

[3] *Sanioris medicinae magistri D. Rogeri Baconis angli de arte chymiae scripta,* etc., Frankfurt, 1603; reprinted 1620 as *"Thesaurus Chemicus,"* etc.

[4] By Combach, *Specula mathematica,* etc., Frankfurt, 1614.

[5] Reprinted at Venice, 1750.

Roger Bacon and Francis Bacon.

The fact that his name was Bacon also contributed to Roger's celebrity, as Francis Bacon was already a favorite with historians of science and thought, and it now appeared that he had borrowed some of his ideas from, or had at least been anteceded in them by, the thirteenth century friar. Both had criticized scholastic method and urged the great practical utility possible from applied science. Akin to the idols of Francis were Roger's four causes of human error. The program of endowed scientific research—based upon an essentially medieval classification of science and list of anticipated inventions—in which Francis tried to interest the society of his time in his *New Atlantis* [2] has a general resemblance to the attempt of Roger to enlist the support of the pope in the cause of science in his *Opus Maius;* while the "Workes of Nature, Works of Art" of the *New Atlantis*, which made that isle almost seem "a Land of Magicians," [3] are rather suggestive of the treatise, "Of the Secret Works of Art and Nature and the Nullity of Magic," by Roger

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[1] So in a MS of the 16-17th century at Cambridge, Trinity 1119, fols. 56v-68v (ends incompletely) "Here followeth the first part of the great work namely the experimental science of Roger Bacon written to Clemens ye Pope."

[2] Ed. A. B. Gough, 1915, p. 14.

[3] *Ibid.*, p. 15.

Bacon to whom indeed Francis seems to allude in the *New Atlantis* as "Your Monke that was the Inuentour of Ordnance, and of Gunpowder." [1] Roger was by some indeed not only regarded as superior to Francis Bacon in priority, but in having emphasized the importance in scientific investigation of mathematical method whose value Francis had failed to appreciate.

Legend of his martyrdom for science.

The next step in the development of the Baconian legend was to supply Roger with a biography suited to his supposed position as a modern experimental and mathematical scientist in the midst of an age of religious bigotry and superstition, of gloomy monks and arid theologians. Surely, especially in view of his later literary and popular renown as a magician, he must have been persecuted and a martyr to science. Abbé Feret has shown how through the nineteenth century successive historians kept adding to the legend of Friar Bacon's persecution by the Franciscan Order without giving any references to the sources for the details which they elaborated from their own imaginations.[2]

Works of Brewer and Charles.

The sources, however, became more accessible with the editing in 1859 in the Rolls Series by Brewer of a number of Bacon's minor treatises hitherto unpublished. Brewer, however, was able from the manuscripts at his disposal, to present only an incomplete text of the *Opus Minus, Opus Tertium,* and *Compendium Studii Philosophiae.* These served nevertheless to give a new stimulus to the interest in and the study of Bacon, especially since two years later appeared Charles' book on Roger Bacon where were included further extracts from his unpublished writings. Unfortunately Charles wrote without knowledge of Brewer's labors,[3] and it must be added that several writers on Bacon since have failed to keep abreast with the latest research in the field.[1] Charles also was guilty, as Abbé Feret has shown, of swelling the story of Bacon's imprisonments, and in other matters he jumped to conclusions unwarranted by the sources or indulged in undiluted imagination.

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[1] Gough, 1915, p. 46.

[2] P. Feret, "Les emprisonnements de Roger Bacon," *Revue des questions historiques*, vol. 50 (1891), pp. 119-42. See also the article on "Roger Bacon" by Theophilus Witzel in the *Catholic Encyclopedia,* whereas the eleventh edition of the *Britannica* still preserves the old legends.

[3] So did Abbé Narbey twenty years later in his "Le moine Roger Bacon et le mouvement scientifique au XIIIe siècle," *Revue des questions historiques,* vol. XXXV (1884), pp. 115-66.

Minor studies of the later nineteenth century.

The works of Brewer and Charles educed a number of minor essays and studies in the following decades. Two unsigned articles on "The life and writings of Roger Bacon" and "The philosophy of Roger Bacon" which appeared in *The Westminster Review* in 1864, are worth noting as combining a tendency towards a sane and critical estimate of what Bacon had actually said and accomplished, with the inclination to regard him as a voice crying in the wilderness of medieval scholasticism and theology. The writer admitted that the merit of the *Opus Maius* "lies rather in the spirit in which it was written than in the facts it records or in any merit which it may have as a scientific whole." He further asserted that "it can easily be shown that of the things which Bacon is asserted to have invented, several were perfectly well known before his time, and the rest are nowhere described in his works." The writer also cited some of Roger's absurd experiments, and said, "Notwithstanding his forcible language about the prerogatives of experimental science and his bitter invective against frail authority, we find him occasionally resting on authority with childlike faith, and treating his favorite science as if its only prerogative was to provoke a smile." Yet he still maintained that "Bacon preached a philosophy of which not half-a-dozen men in Europe saw the value, and of which the majority of really good men feared the results," and that "when Roger Bacon was laid in his grave, the real philosophy was buried with him."[2] Many of the articles which appeared in the years following were of slight value, causing G. Delorme to say in 1910, "Monographs or studies concerning Bacon are numerous, perhaps too numerous." [1] As he proceeded to explain, in many of them Bacon was misunderstood and misinterpreted, so that they must be read with the greatest caution. On the other hand, in 1891 had appeared Abbé Feret's valuable criticism of the legends regarding Bacon's imprisonments.

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[1] An extreme instance was A. Parrot, *Roger Bacon et ses contemporains,* Paris, 1894, in which the legend of the persecution of Bacon was pushed to the last extreme of exaggeration and the author regretted (p. 51) that the *Opus Tertium* still remained unprinted—thirty-five years after Brewer had edited it.

[2] *Westminster Review,* vol. 81, pp. 12, 9, 241 and 252.

Recent editions of Bacon's works.

Next came solid progress in additions to the catalogue of Roger's works and fragments by recent discoveries in the manuscripts, and in new or first editions of a number of his previously known writings. In 1897 J. H. Bridges' fuller, handier, and more correctly arranged two volume edition of the *Opus Maius* replaced Jebb's now extremely rare edition. Unfortunately, while supplied with a helpful introduction, analytical table of contents, and footnotes, this new version was so full of misreadings of the manuscripts and other mistakes in the text due to an imperfect knowledge of Latin, that in 1900 a third and supplementary volume of corrections was added to it. In 1897 Cardinal (then Father) Gasquet discovered and published a new fragment, which he regarded as an introduction to the *Opus Maius,* but which seems to me evidently the first part of the *Opus Minus,* as Mr. Little has already suggested.[2] Passages in this fragment serve to render even more untenable the story of Roger's persecution before 1267. In 1902 Nolan and Hirsch edited Bacon's Greek Grammar. Then in 1909 Professor Duhem gave to the world a newly discovered fragment of the *Opus Tertium;* while in 1911 the British Society of Franciscan Studies printed the *Compendium Studii Theologiae,* edited by Canon (now Dean) Hastings Rashdall, and in 1912 more of the *Opus Tertium,* edited by Mr. A. G. Little. Meanwhile Robert Steele, who in 1905 had edited a fragment of Bacon's

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[1] Vacant and Mangenot, *Dictionnaire de Théologie Catholique,* Paris, 1910, II, 31. It is hardly necessary to list these monographs here; for bibliography of writings on Bacon see also CE, "Roger Bacon."

[2] *Essays,* 389. The phrase *"in hac epistola praeeunte"* which Gasquet takes as a sign that the fragment is part of the *Opus Maius,* occurs also in the *Opus Tertium,* cap. 1 (Brewer, 9).

Metaphysics, began in 1912 to produce the *Communia Naturalium* in sections. Other scholars had announced new or first editions of other treatises, mathematical, medical or alchemistic, as in preparation, and the discovery of a complete copy of the *Metaphysics* in the Vatican Library had just been announced when the world war broke out and temporarily stayed their publication.[1] Recently, however, Mr. Steele has published another volume containing Bacon's introduction to and version of *The Secret of Secrets,* in the preface of which he says: "Medieval students will be glad to learn that the publication of the whole of Bacon's work now seems assured."

Continued over-estimate of Bacon.

As Bacon's works thus became more generally known and as standards of historical criticism grew more strict, not only the facts of his life, but his doctrines, point of view, and personal equation were more carefully examined and analyzed, and previous exaggerated estimates of him were questioned or toned down, although still repeated in some quarters. Indeed, the very writer who rejects some one legend may hold fast to the old view of Bacon in other respects. Especially hard to down has been the notion that Roger Bacon stood almost alone in the middle ages in his advocacy of natural science. Such was still the impression given by otherwise excellent recent estimates of Bacon, such as those in the Catholic Encyclopedia and in Henry Osborn Taylor's *The Medieval Mind,*[2] and such was still the frame of mind in which preparations were made at more than one great university to celebrate in 1914 the seventh centennial of his birth—preparations which resulted at Oxford in the publication of an important volume of commemoration essays by fourteen scholars from various lands and fields of learning, five of whom were editors of Bacon's writings, while others had previously published books or articles concerning him, and still others were authors of general histories of the department of learning to which they were now to estimate Bacon's contributions or relation.

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[1] Little, *Essays* (1914), 376 and 407.

[2] Taylor's discussion of Bacon occurs in Vol. II, 483-508 of the 1911 edition (2nd edition revised and enlarged, 1914). He goes farther than the sources justify in some of his assertions concerning Bacon's life, though he is caution itself compared to some writers. For instance, it cannot be shown that before 1266 Roger's pursuit of learning "had been obstructed by the Order of which he was an unhappy and rebellious member"; nor that "he had evidently been forbidden to write or spread his ideas; he had been disciplined at times with a diet of bread and water."

Beginnings of adverse criticism.

Already, however, before the appearance of this volume Roger Bacon's pre-eminence and superiority to his times had been questioned from more than one quarter. Father Mandonnet in his work on Siger de Brabant and Latin Averroism affirmed that Bacon's importance had been over-estimated in many ways. While Charles had held that, if Bacon's scientific worth had been exaggerated, his value as a schoolman had been lost sight of, Mandonnet declared that as a philosopher and theologian he was behind rather than in the forefront of his age.[1] Rashdall had asserted in 1911 that "Bacon was more the child of his age than he imagined himself to be." [2] W. H. V. Reade in the *English Historical Review* for October, 1912,[3] hoped "that it is not an article of faith with the Society of Franciscan Studies to accept all of Roger Bacon's statements. As regards the state of knowledge among his contemporaries, his assertions are often of no greater value than the similar assertions of his distinguished namesake in a later age." The next year Mr. Reade spoke in the same periodical of "the usual Baconian atmosphere, in which science and superstition are happily or unhappily compounded." [4] In May, 1914, in my paper on "Roger Bacon and Experimental Method in the Middle Ages," [5] I discussed what his "experimental science" really amounted to, and showed that it was representative of the science of his time rather than in revolt against it.

When the Oxford *Roger Bacon Essays* appeared, many of them were marked by a sane and critical attitude, were

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[1] *Siger de Brabant et l'averroisme latin au XIIIe siècle*, 2nd edition, 1908-10, I, 40, 244-48.

[2] Rashdall, 3.

[3] P. 810.

[4] EHR, XXVIII, 805 (Oct., 1913).

[5] *Philosophical Review*, XXIII, 271-98.

The Commemoration Essays

restrained and scientific in tone, and did not indulge in glowing but unsubstantiated eulogies of the noted friar. Professor David Eugene Smith gave warning that "one is liable to be led away by enthusiasm, when writing upon the occasion of the seven hundredth anniversary of any great leader, to read into his works what is not there, and to ascribe to him abilities which he never possessed." [1] But this tendency both he and most of his fellow essayists successfully resisted, and the main achievement of the volume was to point out Roger's indebtedness to others for some of the ideas upon which his fame has rested and to note his mistakes and superstitions, rather than to bring to light anything new to his credit.[2] It became evident that a careful examination of those treatises by Bacon which had been recently edited or were in preparation for publication, and of those which have recently been brought to light in manuscript form or are still difficult of access in old editions, was unlikely to add much to his stock of ideas as found in the now well-known *Opus Maius, Opus Minus* and *Opus Tertium.*

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[1] P. 182.

[2] In articles published in 1915 ("Adelard of Bath and the Continuity of Universal Nature" in *Nature,* XCIV, 616-17; "Roger Bacon and Gunpowder," in *Science,* XLII, 799-800) I disputed Professor Duhem's crediting Bacon with originating the theory of universal nature and Colonel Hime's ascribing to him the invention of gunpowder. In the present work these articles will be found embodied in the chapter on Adelard of Bath and in Appendix II to this chapter.

APPENDIX II

ROGER BACON AND GUNPOWDER

In his paper "Roger Bacon and Gunpowder" contributed to the *Roger Bacon Commemoration Essays,* Colonel Hime tries to prove Roger Bacon the inventor of gunpowder by the method employed to prove Francis Bacon the author of Shakespeare's plays—a cipher. Since other contributors to the same volume refer favorably to this effort (Mr. A. G. Little, p. 395, calls it an "ingenious explanation" and Mr. Patterson Muir, p. 301, says that "Colonel Hime establishes a large probability" in its favor) it may be well to note some points against it quite apart from the merits of the cipher itself.

In the first place, the cipher is based upon chapters of the *Epistola de secretis operibus naturae et de nullitate magiae* not found in the early manuscript of that work and considered doubtful by Charles in his work on Roger Bacon. Indeed, the opening phrases of two chapters "Transactis annis Arabum sexcentis et duobus," and "Annis Arabum 630 transactis" suggest their source.

Secondly, Roger Bacon openly alludes to gunpowder in 1267 in his *Opus Tertium* as already in common use in children's toy explosives. Therefore Colonel Hime has to date the *De secretis* in 1248, and to hold that Bacon was at that time "driven to employ cryptic methods by fear of the Inquisition" (p. 334), but that by 1267 "Circumstances had totally changed in the lapse of years; the composition of gunpowder . . . had been divulged, and the first use made of the deadly mixture was for the amusement of children" (p. 321). This transition from fear of the inquisition to child's play might seem in itself a sufficient *reductio ad absurdum.*

But is there any good reason for dating the *De secretis* in 1248? Much of it sounds like a brief popular compilation from Bacon's three works of 1266-7 concocted by some one else later; compare, for instance, the first paragraph of the sixth chapter of the *De secretis* with Duhem, *Un fragment inédit de l'Opus Tertium,* 153-4, and Little, *Part of the Opus Tertium,* 50-51. Charles considered the last five chapters to be of dubious authenticity, and they are not found in the oldest manuscript of the thirteenth century. The dedication of the *De secretis* to William, bishop of Paris, who died in 1249, occurs first in the late edition of 1618 and has not been found by Little in any manuscript.

Then the inquisition bug-a-boo is negligible. Has any one ever shown that the inquisition punished a practical invention? It was not for having invented the telescope that Galileo was persecuted. Moreover, Galileo's was an exceptional case, and it can not be shown that in the thirteenth century the church persecuted men of science. Rather, popes and prelates were their patrons. Finally the inquisition seems to have been set up in England on only one occasion during the middle ages.

But even if we admit that Bacon wrote the *De secretis* as we have it in 1248 and was at that time afraid of the Inquisition, the question remains: why in 1267-8, when mentioning the explosive in those works in which he made such desperate efforts to secure the pope as his patron, and boasted repeatedly of his own superiority to his contemporaries, did he not claim the credit of the invention which he had set forth in cipher twenty years before? The simple answer is: it was not his invention.

One instance must be added to show how Colonel Hime misinterprets the text of the *De secretis* in his eagerness to smell powder everywhere. He writes (p. 324): "Now, towards the end of Chap. X., Bacon speaks without disguise of charcoal under the name of the wood from which it is made, and mentions the two trees, hazel and willow, which give the best. He significantly adds that when charcoal is added to proper proportions of certain other substances, something noteworthy happens. Since, then, charcoal is one of the subjects of these two chapters, it becomes all the more probable that saltpeter forms another." In a note Hime adds the Latin of the passage in question: *Si vero partes virgulti coryli aut salicis multarum justa rerum serie apte ordinaveris, unionem naturalem servabunt: et hoc non tradas oblivioni, quia valet ad multa.*

Let us note first that these last words do not mean, "something noteworthy happens," but "don't forget this, because it's valuable." Thus the true wording does not in the least suggest an explosion, as Colonel Hime's translation does. Rather it suggests if anything the phraseology of mystical and magical works generally, like the closing words of Thebit ben Corat's treatise on Images, *Intellige quod exposui tibi, et si queris ordinem invenies effectum ne dubites.* (Bodleian MS 463, fol. 77v, Explicit.) Secondly, the words *partes virgulti coryli aut salicis* probably do not denote charcoal but twigs or rods of hazel or willow, as they do in Bacon's account of the experiment performed by magicians with a split hazel rod. It occurs both in the *Opus Maius* (Bridges, II, 219) and *Opus Tertium* (Little, 49-50; Duhem, 153); I quote the latter. *Unde magici accipiunt virgas coruli et salicum, et dividunt eas secundum longitudinem, et faciunt eas distare secundum quantitatem palmae, et addunt carmina sua, et coniungunt partes divise; sed non propter carmina, sed ex naturali proprietate.* (Wherefore magicians take rods of hazel and willow, and divide them lengthwise, and hold them the breadth of a palm apart, and add their charms, and the divided parts come together; but not on account of the charms, but from their very natures.) Moreover, we have already heard this matter of the split hazel rod discussed by William of Auvergne, and noted that it was repeated by Albertus Magnus and John of St. Amand, a medieval writer about 1261, as well as by Bacon.

Thirdly, it is probably precisely this hazel-rod experiment to which the writer of the passage quoted by Hime refers, *Multarum justa rerum serie ordinaveris* seems a hurried equivalent for the more specific directions in the passages in the *Opus Maius* and *Opus Tertium,* and this bears out what I have already suggested, that the *De secretis* may be in part at least a brief popular compilation from Bacon's other works. Finally, the phrase *unionem naturalem servabunt* applies better to the bending together in the middle of two halves of a split hazel rod held apart at the ends than it does to a mixture of saltpeter, charcoal and sulphur.

And now what becomes of Colonel Hime's assertion, "Since therefore charcoal is one of the subjects of these two chapters, it becomes all the more probable that saltpeter forms another?" We may alter it to read thus: since charcoal is not a subject of either of these chapters, it becomes all the more improbable that a method of refining saltpeter is disclosed in them in cipher.

CHAPTER LXII

THE SPECULUM ASTRONOMIAE

Who was its author?—Points in favor of Albert as its author—Testimony of medieval manuscripts and authors—Occasion for writing the *Speculum*—Defense of astronomy—And of judicial astrology—The stars do not possess senses or reason—Subdivisions of astrology—Evil images—A second variety—Good astronomical images—The question of free will—And elections—Free will and nativities—Revolutions—Interrogations—Better not to destroy the books of necromancy—Experimental books in the arts of divination—Resemblance of the *Speculum* to Albert's attitude to astrology—Is it more like Bacon on the question of Christ's relation to the stars?—Attitude to magic of the *Speculum* and Albert—Of Bacon and the *Speculum*—Significance of the failure to mention magic in the *Speculum*—Similarity of its citations to those in other works of Albert—Is the *Speculum astronomiae* to be connected with the Paris condemnation of 1277?—The *Speculum* was written before 1277—Condemnation of Siger de Brabant—Condemned opinions connected with astrology; with science and religion—Other later moves against magic at Paris—Appendix I. Manuscripts of the *Speculum astronomiae*—Appendix II. Germath of Babylon, Gergis, and Girgith.

Who was its author?

THE *Speculum astronomiae* [1] has been reserved for separate treatment, partly because it seems to be one of the most important single treatises in the history of medieval astrology, and partly because the traditional ascription of it to Albertus Magnus has been recently questioned and the attempt made to attribute it to Roger Bacon.[2] This attempt has been supported by so little in the way of real evidence for a Baconian authorship that it might be passed by, were it not for the fact that, as sensational assertions concerning either Roger or Francis Bacon are apt to do, it has attracted widespread attention and been unquestioningly accepted by other students of Roger Bacon.[1] Father Mandonnet adduced no manuscript evidence in favor of Bacon's authorship and Gabriel Naudé in the seventeenth century was the first person to suggest it.[2] Mandonnet's argument for the Baconian authorship reduces simply to this, that the views expressed in the work are Bacon's rather than Albert's and that the writing of the *Speculum astronomiae* could be fitted better into Roger's career.[3]

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[1] Contained in Borgnet's edition of Albert's works, X, 629 *et seq.* This text, however, has been severely criticized by F. Cumont, *Cat. cod. astrol. graec.*, V, i, 85, who says of it, "mendis scateat," and who gives a partial version from the MSS (*Ibid.*, pp. 86-105.)

An early edition among the incunabula of the British Museum (numbered IA. 8201) bears the different title, *Liber Alberti magni de duabus sapientiis et de recapitulatione omnium librorum astronomiae.* In the MSS the title also varies considerably.

For a list of some MSS of the *Speculum astronomiae* see Appendix I at the close of this chapter.

[2] P. Mandonnet, *Siger de Brabant et l'averroïsme latin au XIIIe siècle, deuxième édition revue et augmentée,* Louvain, 1911, I, 244-8; and more fully in an article,

Points in favor of Albert as its author.

We shall show, on the contrary, that the *Speculum* is regularly ascribed to Albertus Magnus in the medieval manuscripts and in bibliographies by learned writers of the fourteenth and fifteenth centuries, as well as by most students of Albertus Magnus or of thirteenth century learning since then.[4] The Latin style and the method of presentation adopted in the *Speculum* also more closely resemble Albert's

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Roger Bacon et le Speculum astronomiae, in *Revue Néo-Scolastique,* vol. 17 (August, 1910), pp. 313-35.

[1] Theophilus Witzel, in CE "Roger Bacon"; Paschal Robinson, "The Seventh Centenary of Roger Bacon," in *The Catholic University Bulletin,* January, 1914; A. G. Little, *Roger Bacon Essays,* Oxford, 1914, p. 25.

[2] G. Naudé, *Apologie pour tous les grands personages qui ont esté faussement soupçonnez de Magie,* Paris, 1625, p. 526. Naudé's memory, however, misled him into asserting that Pico della Mirandola had already asserted that Roger Bacon wrote the *Speculum astronomiae,* whereas Pico had merely questioned whether Albert wrote it.

[3] Ch. V. Langlois, in reviewing the first edition of the *Siger de Brabant* (Fribourg, 1899) in *Revue de Paris,* Sept. 1, 1900, p. 71, made some strictures upon Mandonnet's general method of arriving at conclusions which in my opinion were very well taken.

[4] The opinions of a number of late medieval and early modern scholars as to the authorship of the treatise will be found prefaced to the text in Borgnet's edition. J. Sighart, *Albertus Magnus, sein Leben und seine Wissenschaft,* Regensburg, 1857, p. 341 *et seq.* (Paris, 1862, p. 454 *et seq.*) accepted Albert's authorship.

N. Valois, *Guillaume d'Auvergne,* Paris, 1880, p. 308 note, says, "Il paraît impossible de ne pas considérer cet ouvrage comme authentique."

See also M. Steinschneider, *Zum Speculum astronomicum des Albertus Magnus über die darin angeführten Schriftsteller und Schriften,* in *Zeitschrift für Mathematik und Physik,* XVI (1871), 357-96.

style and method than they do Bacon's.[1] It has already been demonstrated that Mandonnet was grossly in error in representing Albert as an unqualified opponent of judicial astrology, and our coming examination of the *Speculum astronomiae* will show that on most points its attitude to astrology is the same as that of Albert, on some points even more conservative than his, and on only one point less so and more like Bacon's attitude. In the attitude of the *Speculum* toward other forms of magic or occult sciences than astrology we shall find a closer approximation to the Albertine than to the Baconian view-point, and also some internal textual evidence which strongly supports the Albertine authorship. Finally we shall argue that, if it is true that the *Speculum* had some connection with the condemnation at Paris in 1277 of 219 opinions attributed to Siger of Brabant, it may have been written for that occasion by Albert as appropriately as by Bacon. And we shall note some of the opinions condemned on that occasion as constituting, with the *Speculum* itself, valuable evidence concerning the relations existing between theology and astrology in the second half of the thirteenth century.

Testimony of medieval manuscripts and authors.

In so far as I have examined notices of manuscripts of the *Speculum astronomiae* in the catalogues or the manuscripts themselves, I have found it in no case attributed to Roger Bacon and regularly ascribed to Albertus Magnus, as the list of manuscripts given in the appendix at the close of this chapter will show. In one or two cases another hand than that in which the text of the *Speculum* is written has suggested "master Philip, chancellor of Paris," as author instead of Albert, but otherwise the manuscripts support the Albertine authorship. The *Speculum* is cited as Albert's in a fourteenth century manuscript.[2] Also the list of writings by Dominicans drawn up before the middle of the fourteenth century ascribed to Albert both a *Contra librum nigromanticorum* and a *Speculum astrobium* (or *astralabicum*).[1] Later in the same century a contemporary of Thomas of Pisa or Bologna, physician and astrologer to Charles V the Wise of France, 1364-1380, cites "Albert the commentator in his Mirror." [2] In 1412 Amplonius in the catalogue of his manuscripts which he wrote with his own hand lists both a *Speculum mathematicum Alberti Magni* and a *Speculum domini Alberti de libris mathematicis;* [3] and Schum's modern catalogue of the Amplonian collection at Erfurt lists three manuscripts of the *Speculum astronomiae* of the fourteenth century and in every case ascribes it to Albert.[4] Early in the fifteenth century also Cardinal Pierre d'Ailly more than once cited the *Speculum* as by Albert,[5] as did Gerson and Nicholas of Denmark in the same century.[6] Pignon and Valleoletanus also ascribed it to Albert in their catalogues of the writings of Dominicans.[7] At the close of the fifteenth century Pico della Mirandola in his work against astrology was almost the first to question Albert's authorship, which he did in an effort to weaken the reliance of the adherents of astrology upon the authority of Albert as a defender of that art.[8] Pico apparently did not possess a sufficiently extensive knowledge of Albert's other writings to pass upon the question of the authenticity of the *Speculum,* or he would not have imagined that by questioning the Albertine authorship of it, he could prevent the adherents of astrology from citing numerous passages in Albert's works in favor of their art. But now as to the astrological doctrine of the *Speculum* itself.

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[1] I am glad to see my view in this regard confirmed by Steele (1920), 267, who says: "It has been suggested that this tract was written by Bacon, but no one with an ear for style could accept the suggestion for a moment."

[2] Amplon. Quarto 377, first half of 14th century, fols. 25-36, Tractatus de iudiciis astrorum Aristoteli attributus. "Incipit liber quidam de iudiciis qui ab Alberto in Speculo dicitur esse Aristotelis et primo de nativitatibus."

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[1] Denifle (1886), p. 236.

[2] BN 7337, p. 45, "albertus commentator in suo speculo dixit quod predicte ymagines sunt mere naturales sicut recepte medicine."

[3] Schum (1887), pp. 785-867, Math. 29, "Speculum mathematicum Alberti Magni"; Math. 69, "Speculum domini Alberti de libris mathematicis."

[4] See Appendix I.

[5] Petrus de Alliaco, *Tractatus de ymagine mundi* . . . and other treatises by both d'Ailly and Gerson, printed about 1480 (numbered IB.49230 in the British Museum).

In the *Elucidarius,* cap. 2, d'Ailly cites "Albertus Magnus in suo speculo" two or three times. In the *Vigintiloquium de concordantia astronomice veritatis cum theologia,* he says, "Unde Albertus Magnus perutiliter etiam tractatum edidit in quo vere astronomie et artis magice libros per eorum principia et fines distinxit." In the *Apologetica defensio astronomice veritatis* he cites "Albertus Magnus utique philosophus, astronomus, et theologus" concerning Albumasar's placing the birth of Christ under the sign Virgo, a passage alluded to in the *Speculum,* but not, as far as I have noted, in Albert's other works.

[6] Borgnet, X, 629.

[7] Quetif and Echard (1719), I, 173.

[8] Toward the close of its first book in his works as published at Venice in 1519 and in 1557: "Quod si mihi opponas Albertum theo-

Occasion for writing the *Speculum.*

The *Proemium* or opening chapter of the *Speculum astronomiae,* or *Mirror of Astrology,* states the occasion for writing it, namely, the existence of certain works hostile to Christianity, many of which are actually concerned with necromancy but make false profession of astronomy or astrology. On this account "some great men" have censured other books which may be quite harmless, and noble volumes of astronomy have been brought under suspicion and into disrepute. Therefore the writer, who describes himself vaguely as a devotee both of the Faith and of Philosophy, has made a critical bibliography of both kinds of works, giving their authors' names, their titles, opening words, and a general notion of their contents.

Defense of astronomy.

In the next chapter the author takes up books which we should regard as purely astronomical, and says that if these were to be suppressed, "a great and truly noble part of philosophy would be buried for a time at least, until owing to saner counsels it should rise again." He adds that those who have read these books know that there is not a single word in them which is, or even appears to be,

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logum praestantissimum fautorem tamen astrologorum, admonebo te primum multa referri in Albertum quae Alberti non sunt, quod et supra tetigimus. Tunc si mihi forte obicias librum de licitis et illicitis, in quo reiicit quidem magos, astronomicos probat auctores, respondebo existimari quidem a multis esse illud opus Alberti sed nec ipsum Albertum nec libri inscriptionem usquequamquam hoc significare, cum auctor ipse quodcumque demum fuerit nomen suum consulto et expresso dissimulet."

After condemning certain statements in the *Speculum* in favor of astronomical images and that magic books be not utterly destroyed, as unworthy of a learned man and a Christian, Pico concludes, "Quae utique aut non scripsit Albertus, aut si scripsit, dicendum esse cum apostolo, in aliis laudo, in hoc non laudo." Pico could hardly have read Albert's discussion of astronomical images in the *Minerals.*

against the Catholic Faith, and that it is not fair for those to judge them who have never even handled them.[1] Thus the writer seems to think that there is some danger of an attack upon even the study of astronomy.

And of judicial astrology.

The author's main concern, however, is with judicial astrology, which in the third chapter he distinguishes from astronomy proper as "the science of judgments of the stars." Of it, too, he speaks in high terms of praise. He declares that it turns man's thoughts toward God, revealing as it does the great Source of all things. Furthermore, it is the bond between natural philosophy and mathematics. "For if the most high God in His Supreme wisdom so ordained this world that He, who is the living God of a lifeless heaven, wills to work in created things which are found in these four inferior elements through deaf and dumb stars as instruments, and if concerning these we have one science, namely, mathematics which teaches us in things caused to consider their Creator, and another natural science which teaches us to find by experience in created things the Creator of creatures; what is more desirable for the investigator than to have a third science to instruct him how this and that change of things mundane is brought to pass by the change of things celestial?"

The stars do not possess senses or reason.

It will be noted that the author of the *Speculum* regards the stars as "deaf and dumb" and the heaven as inanimate. In a later chapter [2] he condemns as "most evidently meriting censure" the assertion made by Albumasar, apparently upon Aristotle's authority, that "the planets themselves are animated by a rational soul." For him the stars are mere divine instruments, deaf to would-be worshipers of them, and too dumb—one would infer—to produce the music of the spheres.

The fourth chapter of the *Speculum* speaks of the four familiar sub-divisions of judicial astrology, namely, revolu-

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[1] Mandonnet (1910), p. 331, incorrectly cites this passage as a defense of works of judicial astrology, a subject which is not broached until the following chapter of the *Speculum*.

[2] Cap. 12.

Sub-divisions of astrology.

tions, nativities, interrogations, and elections. To the last is annexed the science of images, which the author regards as the acme or climax of "astronomy," but with which he admits are associated those necromantic books of evil repute which he proposes carefully to distinguish from the others. This at once reminds us of the passages in Albert's *Minerals* where he spoke of the connection between such images engraved on stones and necromancy, but where his associates were curious to know the doctrine of images none the less, and he affirmed that it was good doctrine. Now, after the fifth chapter, which may be described as a statement of astrological theory and technique in a nutshell, he takes up judicial astrology and its several sub-divisions in further successive chapters,[1] defining the field and describing the literature. A majority of the books listed, good as well as bad, appear to be Latin translations from the Arabic.

Evil images.

Of images the author describes three varieties, the first two of which he severely condemns. The first kind is abominable, including the images of Toz Graecus and Germath of Babylon, those connected with the worship of Venus, and those of Belenus and Hermes. These are exorcized by the names of fifty-four [2] angels who are said to serve in the circle of the moon,[3] but are probably really the names of demons. The names of seven are engraved forwards to procure a good result and backwards in order to ward off evil fortune. Suffumigations also are made with aloes, saffron, and balsam to achieve a good result, with other woods for evil ends. The author explains that the spirits are not truly coerced by such things, but sometimes God allows them to pretend to be, in order to deceive sinful men. The practices associated with this first kind of images he censures as the worst sort of idolatry, although their practitioners, in order to retain something worthy of belief, observe the twenty-eight mansions of the moon and other seasons.

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[1] Caps. 6-11.

[2] Digby 228 gives the number as "LXXII."

[3] The Incipit given by the author of the *Speculum astronomiae* shows that this is the *Liber lune* of which we have treated in our chapter on "Hermetic Books in the Middle Ages." By a coincidence a portion of it is found in the same MS, Digby 228, fols. 54v-55v, with the *Speculum*.

A second variety.

The second variety of images is a little less improper, but still detestable. In it certain names are exorcized by the inscription of characters. Such are the four rings of Solomon and the nine candelabra and the three figures of spirits who are called the princes of the four quarters of the world, and the Almandel of Solomon, the seven names from the book *Uraharum*,[1] the fifteen from *The Institutes of Raziel,* and so on. "Far from us be this sort also," says our author, "for it is open to the suspicion that beneath the names in unknown tongues may lie hidden something contrary to the purity of the Catholic Faith."

Good astronomical images.

The third variety of images, in which the author sees no harm but much good, and which he has called "the sublimest part of astronomy,"[2] are purely astronomical images which derive their virtue from the configurations of the sky but admit no other inscription of characters, and neither exorcisms, invocations, nor suffumigations.[3] In a later chapter,[4] however, he permits in addition to astronomical figures and symbols the engraving of certain simple words and images of objects of obvious meaning, such as a scorpion and the word *Destruatur* upon an image intended to drive scorpions away.

The question of free will.

Meanwhile, between these two chapters upon astronomical images, the author returns in four chapters to the other sub-divisions of astrology, mainly with the purpose of investigating whether revolutions, nativities, interrogations, and elections are incompatible with freedom of the human will,—a question upon which he has already touched a little in previous chapters. He maintains the usual position that the celestial influences make impressions according to the fitness of matter to receive them, and that man by using his intellect can to a considerable degree be master of his fate.

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[1] This word is variously spelled in different MSS, for instance, in Digby 228, "Muhamethçaha"; in Canon. Misc. 517, "Vanhmec."

[2] Cap. 4.

[3] Cap. 11.

[4] Cap. 16.

As usual he cites Ptolemy's *dictum* that "the astrologer can avert much evil from the operation of the stars, if he knows the nature of the influence to be exerted upon him and can prepare himself beforehand to receive it." [1]

And elections.

Therefore the author regards election of favorable hours as an admission alike of freedom of the will and of astrological influence, and affirms that "in entering upon great undertakings, it is rashness, not freedom of the will, to despise election of the hour." [2] Moreover, he asserts that "all philosophers are agreed in this, that when we know the hour of impregnation of any woman, we thereby know the history of the foetus until it breathes and comes forth from the womb and until death." [3] Hence one should choose the moment of conception as carefully as the hour for a surgical operation,—a passage paralleled by Albert's account elsewhere of the care exercised by Nectanebus as to the hour of his intercourse with Olympias.

Free will and nativities.

Despite what he has just said about tracing the history of the foetus until death, the author regards the doctrine of nativities as in large measure inconsistent with freedom of the will.[4] After the mental and moral faculties have sufficiently developed, he believes in freedom of choice, and so holds that the casting of horoscopes, especially in regard to moral characteristics, infringes upon free will. Even when such a matter as length of life is predicted from the constellations for an individual, he contends that it does not mean that one must live that long, but that one's natural term of life cannot be prolonged beyond that point.

Revolutions.

The author seems to think that the human will has very little control over revolutions, by which "is indicated what God, the glorious, will accomplish in a given year through the stars as His instruments" for states and peoples; in other words, such general events as harvests, wars, earthquakes, floods, and terrible prodigies. Events signified by comets come under this head also. All such events the author seems to regard as divinely ordered and he cites Ptolemy and Albumasar to the effect that God's plans are not changeable like those of children or servants.[1]

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[1] Cap. 13.

[2] Cap. 15.

[3] *Ibid.*, "Ceterum in hoc concordati sunt omnes philosophi quod cum sciverimus horam impregnationis alicuius mulieris sciamus per eam quid fiet de fetu donec inspiret et quid usquequo egrediatur ab vulvo et quid fiet usque ad obitum."

[4] Cap. 13.

Interrogations.

As for the practice of interrogations, the author affirms that to inquire of the stars what course of action one should pursue "does not destroy, but rather rectifies free will." Some questions asked of astrologers, nevertheless, are very difficult to reconcile with free will, for example, the question whether another person will answer one's request. If an astrologer is able to answer such a question beforehand, it seems to indicate that the other person has no freedom in the matter. After some juggling with the terms, "necessity" and "possibility," the author thinks that he has found a mode of reconciliation in "the compossibility of free will with divine providence," since with the latter he identifies the significations of the stars, and "God knew from eternity which course the man would choose." Our author hastens to add, however, that God may wish to conceal some things from us, and that he will not assert that "whatever does not escape divine providence is revealed in the heavens." [2]

Better not to destroy the books of necromancy.

In the seventeenth and last chapter the author returns to the subject of books of necromancy and suggests that after all even these had better be preserved rather than destroyed, because the time is now perchance near when, for reasons which he will not now disclose, it may be of advantage to consult them occasionally; "yet let those inspecting them beware of abuse of them."

Experimental books in the arts of divination.

The author adds that there are also "certain experimental books whose names have the same ending as nigromancy," namely, books in the subjects of geomancy, hydromancy, aerimancy, pyromancy, and chiromancy. Thus we have another example of the association of experiment and magic. These arts, however, in his opinion "do not deserve to be called sciences, but babblings (*garamantie* or

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[1] Caps. 7 and 12.

[2] Cap. 14.

garrimantiae)."[1] Hydromancy consists in washing the entrails of animals and inspecting the fibres. Pyromancy divines from the appearance of the fire by which the sacrifice is consumed. Both these arts probably involve a sort of idolatry. The author finds nothing idolatrous in geomancy, however, which is based upon astrology and numbers. But aerimancy is frivolous, though it may pretend to be based upon number. Chiromancy he does not wish to judge hastily, because it may be a part of physiognomy which in turn depends upon astrology, since in physiognomy both the physical peculiarities and the personal characteristics inferred from them are due to the stars. The author thus shows the common tendency of medieval men of learning to justify only such methods of divination as they felt could be based upon astrology.

Resemblance of the *Speculum* to Albert's attitude to astrology.

The foregoing analysis of the *Speculum astronomiae* has made it evident that its attitude toward astrology is not at all a peculiar one but just about the usual position of Christian scientists in the twelfth and thirteenth centuries. On the subject of astrological images, however, its view is that of Albertus Magnus and Roger Bacon rather than that of William of Auvergne or Thomas Aquinas. In general the astrological position of the *Speculum* closely parallels the attitudes of Albertus Magnus and Roger Bacon, who in turn held almost identical views. If anything, the *Speculum* is somewhat less favorable to astrological doctrine than Albertus. Whereas he in large measure accepted the casting of horoscopes, although saving free will, it emphasizes the conflict between free will and nativities. And it more emphatically denies that the stars are animated, a point upon which he seemed rather hazy in his scientific treatises. But there is no actual contradiction between the *Speculum* and other works of Albert on these points, and we have already seen in the case of his theological and Aristotelian works that Albert is likely to state the same thing somewhat differently according to the point-of-view from which he writes. The writer of the *Speculum* is obviously desirous to conciliate a theological opposition to or suspicion of "astronomy" and therefore naturally inclines to be moderate and conservative in his advocacy of astrological doctrine.

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[1] This sentence was omitted in Ashmole 345, but occurred in other MSS which I examined.

Is it more like Bacon on the question of Christ's relation to the stars?

On one point only does the *Speculum* appear more radical in its astrological theory than Albert elsewhere and more in accord with views expressed by Roger Bacon. We have heard Albert in his *Summa* deny that Christ was born under the influence of the stars, while Bacon was inclined to agree with the astrologers that He was, in so far as His birth was natural and His nature human. The writer of the *Speculum* cites Albumasar to the effect that the Virgin birth of Jesus Christ was prefigured in the sky,[1] and regards this assertion as a notable confirmation of the true Faith, not that the Lord of all things was under the stars but that what God had decreed was signified by the stars. Thus there is after all perhaps no necessary conflict with Albert's attitude in the *Summa,* since both *Speculum* and *Summa* deny that Christ is under the stars. However, the *Speculum* gives the impression that the birth of Christ was signified astrologically; the *Summa,* that it was signified miraculously. But neither does the *Speculum* quite agree with Bacon who suggests that Christ's body was under the stars. And the fact that Bacon cites the same passage from Albumasar is of little value as a sign that he is the author of the *Speculum,* since the passage in Albumasar was a well-known one and is cited in such a vernacular work as *The Romance of the Rose.*[2] Thus the astrological doctrine of the *Speculum* offers little or no reason for questioning the traditional ascription of that treatise to Albertus Magnus.

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[1] Cap. 12 (Borgnet, X, 644), "figuratam esse in coelo nativitatem Jesu Christi de Virgine."

[2] Ed. F. Michel, Paris, 1864, v. 20109-18,

"Albumasar néis tesmoigne
Comment qu'il séust la besoigne,
Que dedens le virginal signe
Nestroit une pucele digne,
Qui sera, ce dist, virge et mère,
Et qui alètera son père
Et ses maris lez li sera
Qui jà point ne la touchera.
Ceste sentence puet savoir
Qui vuet Albumasar avoir."

Attitude to magic of the *Speculum* and Albert.

We have next to inquire, does the attitude of the *Speculum* to other magic arts accord or conflict with that of Albert elsewhere? Our study of Albert's attitude toward magic in his other works has made it abundantly evident that Mandonnet was mistaken in deeming him too hostile to such superstition to have written the *Speculum*. He is, on the contrary, too favorable, if anything, toward magic, to have been the author of that treatise. Indeed, it was to the *Speculum astronomiae,* which he accepted as a genuine work, that Peter of Prussia appealed in his effort to prove Albert's hostility to necromancy and magic. Yet Mandonnet cites these very pages of Peter of Prussia in his effort to show that Albert was too hostile to occult arts to have written the *Speculum!* On the other hand, we saw that Albert's attitude to magic varied somewhat in his different works, so it is no disproof of his authorship of the *Speculum* that it seems more hostile to magic than some of Albert's utterances elsewhere. The occasion of writing the treatise is probably sufficient to explain this.

Of Bacon and the *Speculum*.

We have to admit, however, that Roger Bacon almost invariably spoke of "magic" unfavorably, whereas Albert a number of times used the word in a good or neutral sense. Thus there might seem to be some reason for ascribing the *Speculum* to Bacon for the exactly opposite reason to that advanced by Mandonnet, namely, that he displayed more hostility than Albert to magic. Also there is a certain resemblance between the attitude of the author of the *Speculum* toward books of necromancy and what we saw to be Bacon's attitude toward books of magic in his *De secretis operibus artis et naturae et de nullitate magiae*. But there is also a difference, and when Mandonnet asserts, "Both authors reject books of magic," [1] he gives a false impression and overlooks an interesting point. For the *De secretis operibus* not only tries to distinguish between books of magic and others which are unjustly regarded as magical, it also is largely devoted to an attack upon "magic." And such censure of magic is frequent in Bacon's works. The *Speculum,* on the other hand, distinguishes between "necromantic" and "astronomical" works, and never mentions "magic."

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[1] *Revue Néo-Scolastique,* 1910, XVII, 326. "Les deux auteurs repoussent les livres de magie."

Significance of the failure to mention magic in the *Speculum.*

Is not this significant? Had Bacon written the *Speculum,* would he not have indulged in his usual censure of magicians and their follies? But if Albert wrote the *Speculum,* is it surprising that he maintains a discreet silence concerning that "magic" which he had coupled more than once with astronomy and had spoken of as a field bordering upon that of natural science? In undertaking the defense of "astronomical images" against those who looked at them askance, would he deem it prudent to repeat his assertion in the treatise on minerals that to comprehend astronomical images one must go to "the science of the magi"? In that treatise on minerals, it will be recalled, he had been bold enough to propose to discuss the doctrine of images, even if it was closely associated with necromancy, and he twice associated in the same phrase "astronomy and magic and the necromantic sciences." But then he was writing for his pupils and associates who were eager to learn of the images engraved on gems, even if they were connected with necromancy. In the *Speculum* he writes for a different audience, or for an audience in a different mood,—men inclined to condemn books of astronomy and astrology along with books of necromancy. Where before he admitted an association, he now has to make a contrast and to give the impression of a great gulf fixed between necromancy and astronomy. To save astrology from hostile attack he gives up necromancy, and probably willingly and sincerely enough, since his allusions to it even in the treatise on minerals were rather unfavorable. Is it strange that he says nothing of the connecting link, "magic," which he perhaps does not wish to condemn, yet does not feel it expedient to defend? May it not be one of those reasons, which the author of the *Speculum* says he will not disclose, why even the books of necromancy had better be preserved rather than destroyed?

Thus the failure of the author of the *Speculum astronomiae* to use the word "magic" does not sound in the least like Roger Bacon, but does seem to be just about what one might expect in the circumstances from Albert, whose mentions moreover of "magic" in his other works are brief and occasional.

Similarity of its citations to those in other works of Albert.

Finally we may note a positive bit of evidence in favor of the Albertine authorship of the *Speculum* which has hitherto escaped notice. His other writings mention some of the very books of necromancy which the *Speculum* lists and condemns. In his theological *Summa,* when denouncing magic as concerned with evil spirits, he supported his view not merely by the authority of the saints and common report, but also by "the teachings of that branch of necromancy" which treats of "images and rings and mirrors of Venus and seals of demons," and is expounded in the writings of Achot of Greece, Grema of Babylon, Hermes the Egyptian, and other treatises which he mentions.[1] Again in the treatise on minerals, in investigating why gems are engraved with images, he cites as authorities Magor Graecus, Germa Babylonicus, and Hermes the Egyptian.[2] The *Speculum* also especially mentions in its list of necromantic books on images Toz Graeci, Germath of Babylon, Belenus, and Hermes.[3] Leaving Belenus out of account, there can be little doubt that the other three names are identical with the two preceding trios. One also is impelled to believe that the same Albert wrote *Summa, Mineralium,* and *Speculum,* and it may be added that the variation in the attitude towards images and necromancy in the latter two is no greater than the difference in the attitude towards magic which we observed between the first two of those treatises. This too makes it plausible that Albert should have adopted a third attitude of silence concerning "magic" in the *Speculum.*

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[1] *Summa,* II, 30.

[2] *Mineral.,* II, iii, 3.

[3] *Speculum,* cap. 11. For some further discussion of Germath of Babylon, and Gergis or Girgith see Appendix II.

Is the *Speculum astronomiae* to be connected with the condemnation of 1277?

There remains the question, when and why was the *Speculum astronomiae* written? Its tone suggests that it is not merely a general defense of astronomy and astrology but a specific reply to some particular attack upon astrological literature made by a party inclined to connect and condemn astrology together with necromancy and other forbidden occult arts. Such an attack can perhaps be seen in the condemnation at Paris in 1277 of two hundred and nineteen opinions attributed to Siger de Brabant. Many of them are astrological and with them are condemned a treatise of geomancy, works of necromancy, and books "containing experiments of lot-casters, invocations of demons, and conjurations perilous to the soul." [1] It is natural to associate the writing of the *Speculum astronomiae* with this affair, and the idea had occurred to me before I read any of Mandonnet's works. It is also natural, especially if one holds the old view that Roger Bacon was persecuted for science's sake and suspected of magic, to wonder if there is not some connection between the condemnation of 1277 and his own condemnation in 1278 "on account of certain suspected novelties"; and Mandonnet is not the first to do so.[2] But he is the first to suggest that Bacon was condemned in 1278 for having written the *Speculum astronomiae* in connection with the other condemnation of 1277. But we have seen that there is little reason for thinking that Bacon's condemnation was for astrology or magic. Second, it may be doubted whether anyone would have been condemned for so mild a work as the *Speculum astronomiae,* nor in 1277 could its contents have been regarded as "novelties." Third, we have shown that Albert and not Bacon wrote the *Speculum.* Fourth, we have already heard that in 1270 Albert sent a treatise to Paris to help Aquinas in connection with the affair of Siger de Brabant, and that in 1277 he came to Paris himself to defend his own Aristotelian teaching and the memory of Aquinas in connection with the condemnation of the 219 articles. If so, who could have been better fitted to write on that occasion as a representative both of the Faith and of Philosophy than the venerable dean both of Christian theologians and of Aristotelian scientists?

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[1] Denifle and Chatelain, *Chartularium Universitatis Parisiensis,* I, 543.

[2] See "The Life and Writings of Roger Bacon," in *The Westminster Review* January, 1864, LXXXI, 13.

The *Speculum* was written before 1277.

But there is a serious objection to dating the *Speculum astronomiae* as late as 1277, especially if Albert is its author, as we have shown every reason to believe. It is that the writer of the *Speculum* speaks of the twelfth and thirteenth (meaning our thirteenth and fourteenth) books of the *Metaphysics* of Aristotle as "not yet translated." [1] But Albert is acquainted with these books and gives a paraphrase of them in his own Commentary on the Metaphysics, which, as Mandonnet himself has elsewhere shown,[2] was completed in 1256. It is true that Aquinas in his *De unitate intellectus contra Averroistas,* written in 1270, still seems to regard the last books of the *Metaphysics* as untranslated,[3] which leads Grabmann to argue that Albert must have revised his Commentary to include the last books of the *Metaphysics* after 1270.[4] But this fails to explain how Albert or anyone else writing in 1277 or 1278 could still speak of these books as "not yet translated," since Albert could neither have translated nor commented upon them after 1277, since he died in 1280 and Ptolemy of Lucca tells us that for about three years before his death his intellectual faculties had declined. Thus the *Speculum astronomiae* was apparently written before 1277 and perhaps before 1256.

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[1] *Spec. astron.,* cap. 12 (Borgnet, X, 643).

[2] In *Revue Thomiste,* V (1897), 95; cited by Grabmann (1916), p. 163.

[3] A fact which Mandonnet, *Revue . Néo-Scolastique,* XVII (1910), 318, actually attempts to use to show that the *Speculum* was written after 1270, holding that the passage in question in the *Speculum* must have been copied from Aquinas, since before 1270 no one but Aquinas knew of the existence of the 13th and 14th books of the *Metaphysics* at all. Yet they are included in Albert's *Commentary,* which Mandonnet himself had dated in 1256!

[4] Grabmann (1916), pp. 163-9; the evidence presented for this view is not very convincing. The fourteen books of the *Metaphysics* are found in Latin in MSS dated by the catalogues in the 13th century: S. Marco X, 57, fols. 1-75, de metaphysica libri quatuordecim; Additional 17345, late 13th century, according to the catalogue the *antiqua translatio* ascribed to Thomas of Cantimpré.

Condemnation of Siger de Brabant.

Although it thus appears to have no actual connection with the *Speculum astronomiae,* we may nevertheless consider here as bearing on the same topic of theological opposition to certain occult arts and even to astrology, the condemnation in 1277 by Stephen, bishop of Paris, and "doctors of sacred Scripture" of 219 opinions attributed to "Siger de Brabant, Boetius of Denmark, and others." Siger seems to have been an Averroist of somewhat pronounced type and to have held views more evidently incompatible with the Christian Faith than most astrologers or occult scientists. It is possible, however, that his opponents misinterpreted or exaggerated his views. Mandonnet holds that he would have disowned many of the articles, and that, on the other hand, his persecutors inserted also moderate opinions such as were held by Albertus Magnus and Aquinas, in an effort to give the impression that infidels, Averroists, and moderate Aristotelians were all alike, and to discredit the reconciliation of Aristotle and Christian doctrine which Albert and Aquinas fathered.[1] Dante speaks well of Siger in the *Inferno.*

Condemned opinions connected with astrology; with science and religion.

We may note those articles which bear upon astrology, a very considerable number, with the addition of a few concerned with the relations of science and theology. It will be observed that the moderate thirtieth article is scarcely consistent with some others, and that the last clause of the 207th article, which seems an explanation inserted by the condemners, indicates that even they accept the influence of the stars within certain limits. In any case, while it is to be remembered that the condemnation is not primarily directed against astrology, the articles are of interest as showing both what adherents of astrology might believe and what its opponents might accuse them of and condemn them for.

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[1] Mandonnet, *Siger de Brabant et l'averroïsme latin au XIIIe siècle,* Fribourg, 1899, cap. 9.

"6. That when all the celestial bodies return to the same point, which happens every 36,000 years, the same effects will recur as now.

30. That superior intelligences create rational souls without motion of the sky, but that inferior intelligences create the vegetative and sensitive souls by means of the motion of the sky.

38. That God could not have made first matter except by means of a celestial body.

61. That God can do contrary things, that is, by means of a heavenly body which is variable in its whereabouts.

65. That God or intelligence does not send science to the human soul in sleep except by means of a heavenly body.

74. That the intelligence which moves the sky influences the rational soul just as the body of the sky influences the human body.

92. That the heavenly bodies are moved by an intrinsic principle which is the soul; and that they are moved by a soul and by appetitive virtue just like an animal.

94. That there are two eternal principles, namely, the body of the sky and its soul.

102. That the soul of the sky is intelligence, and the celestial circles are not instruments of intelligence but organs.

112. That superior intelligences impress inferior ones just as one soul impresses another; . . . and by such impression a certain enchanter by his mere gaze cast a camel into a pit.[1]

132. That the sky is the cause of the physician's will, that he cures.

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[1] That this opinion was condemned in 1277 did not keep Peter of Abano from stating in his *Conciliator* of 1303 that by power of fascination a man could be cast into a well and a camel into a hot bath,—Differentia 135. Indeed William of Auvergne, a previous bishop of Paris who had himself condemned "errors" in 1240, tells in his *De universo* (II, iii, 16, edition of 1591, p. 986) of a man who cast down a camel by merely imagining its fall.

133. That the will and intellect are not moved in acts by themselves but by an eternal cause, namely, the heavenly bodies.
142. That from diversities of places come the necessities of events.
143. That from diverse signs of the sky are signified diverse conditions in men, as well of spiritual gifts as of temporal things.
150. That man ought not to be content with authority to gain certitude on any point.
152. That the utterances of theology are founded on fables.
154. That philosophers are the world's only wise men.
161. That the influences of the stars on free will are occult.
162. That our wills are subject to the power of the heavenly bodies.
163. That the will of necessity follows that course of whose advisability the reason is firmly convinced, and that it cannot abstain from that course of action which reason dictates. This necessity is not compulsion but the nature of the will.
164. That man in all his acts follows appetite and always the greater.
167. That by certain signs men's intentions and changes of mind are known, and whether their intentions will be achieved; and that by such figures are known the outcome of journeys, the captivity of men, their freedom from captivity, and whether they will become sages or scoundrels.
174. That there are fables and false statements in Christian Scripture as in others.
175. That Christianity hinders science.
189. That when intelligence is full of forms, it impresses

those forms on matter through the heavenly bodies as through instruments.[1]

195. That fate, which is the disposition of the universe, proceeds from divine providence, not immediately but by means of the motion of the superior bodies; and that this fate does not impose necessity upon inferior things, because they have contrariety, but upon superiors.[2]

206. That he attributes health, infirmity, life and death to the position of the stars and the aspect of fortune, saying that if fortune regard him, he will live; if not, he will die.

207. That in the hour of a man's generation, in his body and hence in the mind which follows the body, there exists in man from the order of superior and inferior causes a disposition inclining him to certain actions or results. An error, unless understood only of natural results and by way of disposition." [3]

In our chapter on Raymond Lull we shall speak of a treatise written by him in 1297 in which he deals with some of these opinions condemned in 1277.

Other later moves against magic at Paris.

With the condemnation in 1277 along with the opinions of Siger of Brabant of a geomancy, books of necromancy, and others containing invocations of spirits, may be mentioned two later attempts of authorities to discourage the study or practice of magic at Paris. One, to which we have already alluded in our chapter on Roger Bacon, is a constitution of the Franciscans on May 25, 1292, forbidding their students at Paris to spend for other purposes the money sent them for books or to have curious books copied.[4] We are, however, more pained than surprised to learn that such a regulation was necessary in the Order.

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[1] Which seems to contradict 102, which stated that "the celestial circles are not instruments of intelligence but organs."

[2] This opinion is, however, that of Boethius and most of the other discussions of fate which we have noted.

[3] The Latin text of the 219 opinions will be found in the *Chartularium Universitatis Parisiensis*, I, 543, *et seq.*

[4] *Chartularium Universitatis Parisiensis*, II, 56-7.

The other is a letter of April 3, 1318, or 1319, of Pope John XXII to William, bishop of Paris, thanking him for a donation received and urging him to attend to the improvement of the University of Paris and especially to banish from it and from his diocese "nigromancers, diviners, poisoners, and others engaged in reprehensible arts of this sort," whom the pope further describes as criminals.[1] There is nothing to suggest that astrologers and their writings are included in either of these two later moves against superstitious arts or black magic.

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[1] *Chart. Univ. Paris.,* II, 229.

APPENDIX I

MANUSCRIPTS OF THE SPECULUM ASTRONOMIAE

The descriptions of the first group of MSS in the Amplonian collection at Erfurt are drawn from Schum's *Verzeichniss.*

Amplon. Quarto 189, on the verge of the 13th-14th centuries, following fols. 40-67 Alberti Magni liber de mineralibus et lapidibus, fols. 67-8 Notae de coloribus (fortasse Alberti Magni tribuendae), and fol. 68 Notae variae, come in a new hand at fols. 68-70 De imaginibus astronomicis, and fol. 70 Notae ex capitulis speculi Alberti quibus de imaginibus et de commendatione astronomiae inscribitur extractae.

Amplon. Quarto 223, late 14th century, fols. 105-116, Tractatus de nominibus librorum astronomie cui inscribitur *Speculum Alberti* (Magni). "Explicit liber de nominibus librorum astronomie dictus Speculum Alberti."

Amplon. Quarto 348, 1393 A. D., fols. 114-125, "Incipit liber Alberti Magni episcopi Ratisponensis de libris mathematice facultatis licitis et illicitis Erphordie conscriptus . . . / . . . Finitus est Erphordie liber Alberti de libris mathematice facultatis licitis et illicitis 1393 die 29 mensis Maii luna in capricorno et sole in geminis," etc.

Amplon. Quarto 349, by two different hands of the mid-14th century, fols. 98-108, "Liber de nominibus librorum astronomie sive speculum domini Alberti."

The following MSS in the Bibliothèque Nationale and Bodleian are those which I have personally examined:

BN 7440, 14th century, fols. 1r-7r. The Speculum astronomiae here opens without Titulus or Incipit but some later hand has inserted, "Incipit speculum alberti prohemium." Only the bottom of the second column on fol. 1r is occupied by the text of the Speculum, which is preceded by some lines of text ending "Explicit liber hermetis" which are the conclusion of the treatise on fifteen stars, stones, and herbs at fols. 13v-16v. The Speculum is followed at fol. 7r by the De urina non visa of William of England or Marseilles and other astrological treatises. At fols. 38v-40v and 25r-32v is an astrological passage from what is called in the headings at the tops of the pages "Meth'a Rog'i" (Metaphysics of Roger), which Mr. Steele has printed in Opera hactenus inedita Rogeri Baconi, Fasc. I. But the occurrence of this fragment in the same MS with the Speculum can scarcely be adduced as any indication of the Baconian authorship of the Speculum, since the same later hand, which has here inserted "Incipit methafisica Rogeri baconis de ordine predicatorum" (*sic!*), wrote in the ascription of the Speculum to Albert.

BN 7408, 15th century. Here the Speculum is bound at the close of a MS containing astronomical and astrological works. It is ascribed to Albert not only in the general table of contents for the MS and in a Titulus written at its beginning in another hand than its text, but the text itself closes, "Expliciunt liber dicta speculum alberti magni de nominibus librorum astronomie tam demonstrativorum quam judicialium quem composuit frater albertus ut sciatur qui libri sunt contra fidem et qui non." The same hand then goes on to cite Albert's work on minerals concerning images on stones.

BN 7335, 15th century, fols. 108r-114v, "Incipit libellus alberti magni de discretione astronomie a falsa aliter intitulatus speculum . . . / . . . Explicit tractatus qui dicitur speculum domini alberti."

Digby 228, 14th century, fol. 76-, no author is named in the text itself of the Speculum but in the upper margin of this page a hand of the same century has written the following note: "Tractatus magistri Philippi cancellarii Parisiensis de libris astronomie qui tenendi sunt secundum integritatem fidei catholice et qui non." This MS seems to give a more correct text than any of the three following other MSS in the Bodleian.

Ashmole 345, later 14th century (the name, "Kenelme Digby," is written at the top of the first page of the MS), fols. 14v-21, Tractatus in quo corriguntur errores quorundam astrologorum et philosophorum fidei catholicae repugnantes, "Occasione quorundam librorum apud quos non est radix scientie . . . / . . . sed quod ambo inveniuntur ab eodem creata. Explicit." Although it opens as usual, it omits much of the earlier chapters and bibliography of the Speculum. No author seems to be named.

Digby 81, on paper, fols. 102-18, "Explicit iste tractatus quem composuit Albertus frater predicator." But a hand of the 17th century adds the note, "Albertus non fuit author huius libri sed Philippus cancellarius Parisiensis, ut ex vetustissimo exemplari manuscripto manifestum est," which I presume is a reference to the note to that effect in Digby 228. As a table of contents for this portion of the MS at fol. 101r shows, this "Albertus de scientiis licitis et illicitis" was once followed by "Cosmographia Rogeri Bacon"; but it will be noted that although the 17th century hand questions Albert's authorship, its writer was not moved to ascribe the Speculum to Bacon.

Canon. Misc. 517, 15th century, fols. 52v-59v, "Incipit speculum alberti . . . / . . . finis Spectubili Alberti." Written in a print-like hand which is prettier than Digby 228, but the text nevertheless contains a good many slips, as in the omission of words from the Incipits in the bibliographies of deserving and illicit books. Also it has 19 chapters instead of the usual 17, as in Digby 228 and the printed text.

The following MSS I have not examined but list according to the various catalogues:

Arsenal 387, 13th century, fols. 16-31. Fols. 15-34 are now missing but in the 16th century Claude de Grandrue gave the description: "Liber Alberti magni de nominibus librorum astronomie tam demonstrativum quam judicialium, ut sciatur qui libri sunt contra fidem et qui non." The correspondence of this wording with BN 7408 is perhaps worth noting.

Brussels, Library of Dukes of Burgundy, 936, anno 1418, Alberti Maqui Speculum astronomiae; 1030, 15th century, Alberti Magni Speculum; 1466, 15th century, an abridgement of the Speculum.

Florence, Ashburnham 136, early 15th century, fols. 178-83, Speculum Alberti Magni.

Catania 87, 15th century, # 13, Albertus Magnus, Summa librorum astronomiae.

S. Marco XI-71, 16th century, 19 fols., Alberti Magni astronomiae speculum. Valentinelli remarks, "Opus Rogero Baconi male tributum, recte sub Alberti Magni nomine pluries editum est."

CLM 27, 14-15th century, fol. 55, Alberti Magni iudicium de libris Messahallach sequentibus; presumably a fragment.

CLM 221, 15th century, fols. 223-8, Speculum mathematicae.

CLM 267, 14th century, fol. 91, de recapitulatione omnium librorum astronomiae.

CLM 8001, 14th century, fol. 145, where the Speculum occurs in the same MS with Albert's De vegetabilibus and other commentaries on Aristotle.

Berlin 963, 15th century, fol. 142, "Speculum dñi alberti magni episcopi ratisponensis. Occasione quorundam librorum. . . ."

Vienna 5508, 14-15th century, fols. 161v-180v, Speculum geomanticum (the MS as a whole is largely devoted to geomancy, but the opening words, "Occasione quorundam librorum" identify it as our treatise).

CU Trinity 1185, 16th century, fols. 1-7, Speculum Alberti Magni, "Occasione quorundam librorum."

APPENDIX II

GERMATH OF BABYLON, GERGIS, AND GIRGITH

Germa or Grema or Germath of Babylon is a name to which I believe I have met only one other reference, namely, in Cecco d'Ascoli's *Commentary on the De principiis of Alchabitius* (ed. Boffito, p. 19), where for the assertion that the stone *anthrax* keeps emitting water and so also has to attract water to supply the loss are cited "Evax rex arabum et Zot grecus et Germa babilonensis."

In another chapter of the *Speculum* in listing licit works of "astronomy" the author mentions Gergis, *De significatione planetarum in domibus,* which opens, "Sol consurgit." It is perhaps the same as Ashmole 393, 15th century (?), fols. 68v-69v, "Gergis de significatione planetarum ac capitis et caude in 12 domibus. Sol in ascendente significat principatum . . . / . . . neque dimittas que dico tibi nec proferes aliud. Explicit Jergis de significationibus planetarum in domibus 12." See also Steinschneider (1906) pp. 23-4, where other MSS of this treatise are mentioned and also of a "Girgic, De mansionibus lunae." Other forms of the name than Gergis and Girgic mentioned by Steinschneider are Zergis, Jergis, Jargus (Hyargus, Largus) and Georgius; also Gugit. Steinschneider further notes that this author appears in the alchemistic *Turba;* in which connection I may add that Albertus Magnus in *Mineralium* III, i, 4, speaks of a writer on alchemy from that part of Spain which used to belong to the Arabs named Gilgil (Gilgil in secretis suis).

Steinschneider does not note Royal 12-C-XVIII where, following the work of Thebit ben Corat on images, is "another tract on the same subject, apparently by Jirgis ibn al-'Amid. Inc. 'Dixit Balemiz qui Apollo dicitur Ymago prima fit in prima hora. Ends, 'nomen diei Saturni hadah. Explicit.' " Here then Jirgis is associated with Belenus just as Germath of Babylon was in the *Speculum.*

In another MS not mentioned by Steinschneider a *Theory of Magic Art,* which reminds one of the work of Alkindi by that title, is ascribed to a Girgith. Amplon. Quarto 354, 14th century, fols. 60-62, Girgith, Theorica de arte magica, "Cogitacio fuit: res que me ad hoc opusculum . . . / . . . operari voluerit et sic est finis huius tractatus. Deo gratias."

And in the medieval catalogue of St. Augustine's, Canterbury, 1545, we find listed "Documenta Girgith filie Circes," preceded by "Tractatus de sigillis planetarum." That is, Girgith is represented as the daughter of the enchantress Circe, and is apparently connected with magical and astrological images. This community of astrological and magical interest inclines one to believe that all the aforesaid authors are one.

CHAPTER LXIII

THREE TREATISES ASCRIBED TO ALBERTUS MAGNUS BUT USUALLY CONSIDERED SPURIOUS: EXPERIMENTA ALBERTI, DE MIRABILIBUS MUNDI, DE SECRETIS MULIERUM

The three treatises—Are the two treatises on magic by Albert?—Manuscripts of the *Experiments*—Manuscripts of the *Marvels*—Evidence of a fourteenth century bibliography—Opinions of modern writers—Meyer's argument against the authenticity of the *Experiments*—Difficulty of the question—Introduction of the *Experiments*—Virtues of herbs, stones, and animals—The heliotrope—The lily—Two gems—The owl—Evax and Aaron, and the crow—Observance of astrology—Emphasis upon experiment—*De mirabilibus mundi* more theoretical—How account for magic?—Action of characters explained—Incredible "experiments of authorities" upheld—Laws of nature and of magic—Man's magic power—A wonderful world—The chief causes of marvels—Marvels proved by experience, not by reason—Borrowing from the *Liber vaccae* of Pseudo-Plato suggested by the authorities cited—Contents of the *Marvels* characterized—A mixture of chemistry and magic—Two specimens of combustibles—Further discussion of marvelousness in general—The *Marvels* is an experimental book—*De secretis mulierum*—The problem of its authorship—Its citation of Albert, commentary, opening—Nature of its contents—Medieval standards in such matters—Some superstitious recipes—Astrology—Citations of Albert and Avicenna—Appendix I. Manuscripts of the *Experiments* or *Secrets*—Appendix II. Manuscripts of the *De secretis mulierum*.

The three treatises.

IF we have succeeded in showing that there is little reason for questioning the traditional ascription of the *Speculum astronomiae* to Albertus Magnus, and still less reason for attributing it to anyone else, it must on the other hand be admitted that the authenticity of three other treatises current under his name is more dubious. To the consideration of these three treatises we now come, namely, the *Experimenta Alberti, De mirabilibus mundi,* and *De secretis mulierum. The Experiments of Albert,* or *The Secrets of*

Albert (*Secreta Alberti*), as it is usually called in the manuscripts, in the printed editions is generally entitled *Liber aggregationis,* or the book of secrets or virtues of certain herbs, animals, and stones.

Are the two treatises on magic by Albert?

When Albertus Magnus in his treatises on the works of Aristotle in natural philosophy dismissed certain matters as pertaining to the science of magic rather than to physical science, and said that they should be considered in other treatises, it is just possible that he intended to write such books himself. He does not, however, seem to have cited any such writings of his own by title in any of his undisputedly genuine works. Such writings are nevertheless extant under his name, namely, the above-mentioned *Experiments of Albert* and *Marvels of the Universe.* These two treatises already circulated under his name in the middle ages and appeared in numerous editions in the early years of the printing-press.[1] Indeed, a survey of the catalogue in such a library as the British Museum indicates that these treatises were published in about as many editions as all Albert's numerous other works put together. This suggests how much more popular were these brief collections of superstitious experiments and sensational marvels than Albert's longer, more difficult and argumentative, theological and scientific writings.

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[1] I have examined at the British Museum four incunabula editions containing both treatises and numbered (at the time of my reading) as follows: IA.6829 (*Impressum Auguste per Johannem schauren feria secunda post Bartholomei,* 1496); IA.46455; IA.55455 (*per me Wilhelmum de Mechlina Impressus in opulentissima civitate Londoniarum iuxta pontem qui vulgariter dicitur Flete brigge*); 547 b. 1. (*Imprime pour Thomas Laione Libraire Demourant a Rouen*). The text in these editions is nearly identical except for some divergencies in the one printed at Rouen. The edition printed at London is perhaps the most accurate of the four.

I have not seen the following edition: *Liber aggregationum sive secretorum de virtutibus herbarum, lapidum, et animalium,* Naples, 1493-1494; nor an edition printed at Antwerp, 1485, in which the *Liber aggregationis* is bound with the *Quaestiones naturales* of Adelard of Bath. The *Liber aggregationis* was published with the *De mirabilibus mundi* at Frankfurt in 1614, and with the *De secretis mulierum* at Amsterdam in 1643 and again in 1662, but I have not seen these three editions.

I have seen an edition of sixteen leaves containing both *Liber secretorum* and *Liber de mirabilibus mundi,* Venetiis per Marchio Sessa, 1509. Also an edition of both these treatises preceded by the *De secretis mulierum* and followed by the *De secretis naturae* of Michael Scot, Strasburg, 1607, per Lazarum Zetzerum; an edition of Amsterdam, 1740, containing the same four treatises; and an edition of Lyons, 1615, where the *Speculum astronomiae* replaced the work by Michael Scot.

Manuscripts of the *Experiments.*

Of these two treatises the *Liber aggregationis* or *Experiments* or *Secrets of Albert* is found in a number of manuscripts of the British Museum, Bodleian, and other libraries.[1] These are dated in the catalogues as mainly of the thirteenth, fourteenth, and fifteenth centuries. The text is not uniform either in the printed editions or the manuscripts. Some manuscripts contain only part of the treatise or arrange its items in a different order, and sometimes foreign matter is interpolated, but it is clear that they are all different portions or versions of one work. Indeed the three Digby manuscripts in the Bodleian contain practically the same text, and would seem to be copies of one another or of a common original, since an illegible phrase in one is apt to be equally unreadable in the rest. They also all entitle the work the *Secrets* rather than the *Experiments of Albert.* Most of the manuscripts expressly attribute the work to Albert who is variously styled "Albertus Magnus," "Brother Albert," "Brother Albert of the Order of Preachers," or "Brother Albert of Cologne of the Order of Preaching Friars." One manuscript says that Albertus Magnus translated these experiments with herbs, stones, and animals from the Greek and Arabic. Only one of the manuscripts, where a part of the experiments with herbs are called *Jocalia Salamonis,* ascribes the work to anyone else than Albert. Borgnet, who did not include either the *De mirabilibus mundi* or *Liber aggregationis* in his edition of Albert's works, mentions another manuscript where the latter treatise is ascribed to "Brother Albert of Saxony." But aside from the fact that the evidence of a single manuscript is worth little against so many others, if we find the *Experiments* and *Secrets* in manuscripts of the thirteenth and early fourteenth centuries, the work cannot possibly be written by Albert of Saxony who did not flourish until about 1351 to 1361. Moreover, in the fourteenth century manuscripts our treatise is found with other experimental and occult treatises of varied authors, so that it would appear to have been known for some time and copied from earlier manuscripts into these collections. Whether the treatise is by Albert or not, then, there seems no doubt that it was generally ascribed to him in the later middle ages, and that it was composed in the thirteenth century, or at least that the nucleus of it existed then.

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[1] For MSS of this treatise see Appendix I at the close of this chapter.

Manuscripts of the *Marvels.*

Of the *De mirabilibus mundi* manuscripts seem much rarer.[1] I found none in the British Museum, although it contains so many of the *Experiments of Albert* which almost invariably accompanies the *Marvels* in the printed editions. It is also rather remarkable that the former treatise is always called the *Experiments* or *Secrets of Albert* in the manuscripts, and *Liber aggregationis* in the printed editions.[2]

Evidence of a fourteenth century bibliography.

Further evidence that the *Experiments* was at least attributed to Albert at an early date and on the other hand that the *De mirabilibus mundi* was not, is afforded by the bibliography of works by learned Dominicans drawn up in the second quarter of the fourteenth century. Here we find listed among Albert's writings[1] a *De lapidibus et herbis* which may well be the *Experimenta,* since his *De vegetabilibus et plantis* and *De mineralibus* are listed separately, and a *Secretum secretorum Alberti* which may indicate either the *Experiments* or *Secrets* or perhaps the *De secretis mulierum.* On the other hand, in the same bibliography we find a *De mirabilibus* listed not among the writings of Albertus Magnus but attributed to an Arnold of Liège.[2] Perhaps this is why Berthelot states, without giving any reference or reason, that the *De mirabilibus mundi* was written in the fourteenth century by a pupil of Albertus Magnus.[3]

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[1] S. Marco XIV, 40, 14th century, fols. 3-18, *Collectio secretorum mirabilium;* here the title is different and no author is named, but the Incipit, "Postquam scivimus quod opus sapientis est facere mirabilia eorum quae apparent in conspectu luminum," and Valentinelli's description show it to be the *De mirabilibus* or some very similar treatise.

Florence, Palat. 719, 15th century, 101 carte, Albertus Magnus, *Opus de mirabilibus mundi; con qualche parte volgarizzata;* "Postquam sciuimus quod opus sapientis est facere cessare mirabilia rerum quae apparent in conspettu hominum / Et si sterilitas sit uitio mulieris, inuenies uermes multos in olla sua; similiter in alia, si sit uitio uiri."

BN 7287, 15th century, #12, Albertus Magnus, *De mirabilibus mundi.*

Wolfenbüttel 3713, 13th century, fols. 50-122v, *Incerti auctoris Christiani liber de mirabilibus mundi;* as Heinemann says that this is falsely ascribed to Solinus, it is perhaps our treatise.

[2] In this connection it is perhaps worth noting that in at least two MSS the *Liber vaccae* or *Liber anguemis,* ascribed to Plato and Galen, but perhaps having some connection with our *De mirabilibus mundi* (see Chapter 65, pp. 777-780), bears the alternative title, "Liber aggregationum"; Arundel 342, fols. 46-54, "Expletus est liber aggregationum Anguemis Platonis"; Amplon. Quarto 188, fols. 103-104, Liber vacce seu liber aggregacionum diversorum philosophorum.

Opinions of modern writers.

In modern times some writers have accepted these two treatises as Albert's, perhaps unthinkingly, while others have rejected them as spurious. Thus Cockayne gives the description of the herb *Heliotropium* from the *De virtutibus herbarum,* another name for the *Experiments* or *Liber aggregationis,* as by Albertus Magnus.[4] And we find Hoefer reproving Haller and Sprengel for having judged Albertus Magnus too severely on the basis of the same *De viribus herbarum,* "a book of cabalistic recipes" which Hoefer asserts is not his.[5] Borgnet who, as has been said, excluded our two treatises from his edition of Albert's works, held that the "vain and futile matters" which they contain are enough to prove that they cannot be by Albert. Of this the reader may judge for himself by comparing some of the passages concerning occult virtue, astrology, magic, and experiments with toads and emeralds which we have already cited from Albert's works with those which we shall soon give from these two treatises. As the *Histoire Littéraire de la France* says in its article on Albert, "It must be confessed that all his treatises let be seen too often his leaning toward the occult sciences; and they contain, at least in part, the germ of the wretched productions falsely published under his name."[1]

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[1] Denifle (1882), p. 236.

[2] *Ibid.,* p. 233, "Arnoldus Leodiensis."

[3] Berthelot (1893), I, 91. Albert's pupils would have been more likely to write in the thirteenth century.

[4] *Anglo-Saxon Leechdoms,* I, xxxii.

[5] Hoefer, *History of Botany,* p. 92.

Meyer's argument against the authenticity of the *Experiments.*

Meyer in his *History of Botany*[2] made more detailed objections to the Albertine authorship of the *Liber aggregationis.* He argued that Albert's genuine works display a more elegant style and logical arrangement, that the *Liber aggregationis* does not depend on Aristotle as the genuine scientific works do, and that Albert elsewhere condemns the magic which he here expounds. But we have shown that Albert does not always condemn even so-called magic in his other writings, that it is not inconceivable that he may have written treatises on natural magic himself, and that he follows Aristotle only where he has works of Aristotle at hand to follow. Argument from style is always dangerous, since style is apt to alter with the subject and method of a treatise. Furthermore, Meyer seems to have judged the style of the *Liber aggregationis* from the printed text which often differs in wording from the manuscripts. However, I do not know that their style is any more elegant; the manuscripts are hard to read and often seem incoherent. In any case the treatise is mainly a collection of brief statements, largely excerpted from other writings, with little room either for literary elegance or logical arrangement. Meyer further noted, however, that the *Liber aggregationis* gave a different explanation of two names of herbs, *Quinquefolium* and *Jusquiasmus* (or *Jusquiamus*), from that given in Albert's *On vegetables and plants.* Even this divergence might, however, be due to Albert's having followed different authorities in the two works; the *Liber aggregationis* or *Experiments* seems to draw largely from *Kiranides.*

Difficulty of the question.

It may be admitted that the *Experiments* and *Marvels* seem in general rather inferior to Albert's undisputed works, which embody the same sort of superstitions, it is true, but are less exclusively devoted to that sort of thing. But we must expect treatises which deal expressly with magic and marvels to be more superstitious than those which deal professedly with Aristotelian theories and facts learned by experience concerning the natural sciences. Compare the writings of Sir Oliver Lodge on physics and on psychic research. And if the *Experiments* and most of the *Marvels* seem naïve, simple, and unsophisticated compared to the more elaborate arrangement and detail and scholastic argument of the undisputed works of Albert, it is to be noted that they are like other books of their kind, just as the others are like other Aristotelian and scholastic treatises. But from these difficult and hypothetical questions of authenticity or spuriousness let us turn to the writings themselves.

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[1] HL XIX, 378.

[2] *Gesch. d. Botanik,* IV, 81-2.

Introduction of the *Experiments.*

Meyer said that in the *Liber aggregationis* one did not find Albert's chief source, Aristotle. Yet the *Experiments of Albert* open in the manuscripts with the words, "As the philosopher says," to which one manuscript adds, "in the first book of the *Metaphysics*."[1] The philosopher's dictum was to the effect that all science is good but that it may be employed either for good or evil ends. Our author then affirms that "magical science"[2] is not evil, since by knowledge of it one can avoid evil and secure good. This is not unlike the way in which Albert in his *Minerals* justified the science of images as good doctrine, even if it was a part of necromancy, or showed in other passages that astrology was not contrary to freedom of the will since it enabled one to avoid evils and to obtain goods. By this statement the author also serves notice that magical science or the science of magic is to be the subject of the present treatise. Continuing his preface, he mentions "inspection of reasons and natural experiments" as well as "ancient authors" or "doctors" as sources. He has tested many of the statements of these authorities and has found truth in many of them. In the present treatise he intends to make use of the book of Kiranides and the book of Alcorath, later said to be by Hermes, and to speak first of certain herbs, then of certain stones and certain animals and of their virtues. The oldest manuscript that I have seen also promises to treat of the virtue of words,[1] but this promise is not fulfilled and is omitted in the printed text. It may also be remarked now that other authorities than Kiranides and Alcorath are cited in the course of the treatise.

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[1] Sloane 342, fol. 130r, "Sicut dicit philosophus, Omnis scientia de genere bonorum operum est cuius opera aliquando bona aliquando mala sunt prout scientia inutilis (?) per seriem aliquod operatur."

Sloane 3281, fol. 17r, "Sicut vult philosophus in pluribus locis, Omnis scientia de genere bonorum. Verum operatur eius operatio aliis bona et aliis mala."

Sloane 351, fol. 25r, "Sicut vult philosophus in primo metha."

Digby 37, 147, and 153 (all of the 14th century) read—variant readings in parentheses: "Quia sicut vult (147, Sicut dicit) philosophus in pluribus locis (147 omits locis) omnis scientia de genere bonorum est verumptamen eius operatio aliquando bona aliquando mala (aliquando mala in 147 only) est (in 153 only) prout scientia mutatur (so 147; 37, in natura; 153, innata) ad malum sive ad bonum finem" (147, ad bonum vel ad malam).

These specimens, if I have correctly read the passages, may serve to illustrate the variation in the MSS of the treatise and the faulty grammar and syntax or careless copying in some of them.

[2] "Scientia magicalis" in the printed texts and all three Digby MSS and in Sloane 3281. Sloane 342 has "scientia ymaginabilis"—which, it is true, is apt to amount to the same thing—and Digby 37 at first speaks of "scientia mathi^{b}" (?) but later of "scientia magicalis."

Virtues of herbs, stones, and animals.

The author then considers sixteen herbs,[2] about forty-five stones,[3] and some eighteen animals,[4] many of which are birds. In the printed text and some manuscripts there are also given the virtues of seven herbs according to the emperor Alexander, which is really a distinct treatise of which we have spoken elsewhere. The names are sometimes given in several languages after the manner of the *Herbarium* of the Pseudo-Apuleius. Thus a treatise which began with justification of magical science turns out to be simply a treatment of the virtues of natural objects. But this shows the importance of natural objects in magic, and the virtues here ascribed to them are often indeed magical. One may become invisible, escape dangers, travel in safety, conquer the enemy, win honors, not feel pain, boil water instantly or freeze boiling water or kindle an inextinguishable fire, make a rainbow appear or the sun seem blood-red, excite love between two persons, or arouse joy, sadness, and other emotional and intellectual states, overpower wild beasts, interpret any dream, and prophesy concerning the future. In brief, by the aid of the occult virtues of these natural objects one can accomplish almost anything that any other form of magic could procure. Two or three examples may be given in more detail.

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[1] Sloane 342, fol. 130r.

[2] Elitropia, Urtica, Virga pastoris, Celidonia, Provinca (or Parvinca or Pronenta), Nepta (Nepita, Hepica), Lingua canis, Jusquiamus, Lilium, Viscus quercus, Centaurea, Salvia, Verbena, Melisophilos (Mellisophilos), Rosa, Serpentina. The order of the list varies.

[3] Magnes, Optalmius, Onix, Cristallus, Feripendamus, Siloyces (Felonites), Topacion, Medo, Mephytes (Monfites. Menophites), Asbestos (Albeston, Abaston, Abaton), Adamas, Agates (Gagates), Allectorius, Smaragdus (Esmerendus), Amastitus (Amaticus), Berillus, Celonites (Casmetes), Corallus, *Cristallus,* Lypercol, Crisolitus, Elitropia, Epistrites (Ephisteos), Calcidonius, Celidonius, Gagates, Iena (Gena), Istinos, Tabrices (Grabates, Gabrates), *Crisoletus,* Geratiden, Nicomei (Nicomay), Quiriti (Quirini), Radianus, Urtices (Urites), Lapis lazuli, Saleractus (Salaragdus, Smaragdus), Iris, Galasia, Galiates (Galaites), Draconites, Echites (Etidia), *Epistretes,* Jacinctus, Orites (Origes, Oziches), Saphirus, Sannus (Sampius).

I have italicized repetitions and included variants in parentheses. Sloane 351 and 3281 give only 43 names; Arundel 251 has 46.

[4] Aquila, Taxo, Bubo, Hircus, Camelus, Lepus, Asperolus (Aspiriolus, Capriolus, Experiolus), Leo, Foca, Anguilla, Mustela, Upupa, Pelicanus, Corvus, Milvus, Turtur, Talpa, Merula.

The heliotrope.

The first herb discussed, the heliotrope, if plucked when the sun is in the sign Leo in August and worn wrapped in a laurel leaf with the tooth of a wolf, insures that the bearer of it will be addressed with none but friendly words. If a person who has been robbed sleeps with it beneath his pillow, he will see all the circumstances of the theft repeated in his dreams. If it is placed in a temple, women who have been unfaithful to their marriage vows will be unable to leave the temple until this herb is removed.

The lily.

The lily is an herb which the *Magi* have greatly lauded. It, too, should be plucked when the sun is in Leo, then mixed with laurel juice and buried beneath ordure until worms are generated therefrom. No one can sleep in whose clothing or about whose neck is sprinkled some of the powder made from these worms. Anyone anointed with this powder will contract a fever. If this powder is put in a jar of milk covered with the skin of a cow of one color, the entire herd will cease to give milk. "And this has been tested in our time by certain sorcerers."[1]

Two gems.

The stone Optalmius, wrapped in a laurel leaf, renders one invisible, as its virtue blinds the sight of onlookers. By its aid Constantine became invisible in the thick of the fight. A test of virginity by the stone Galerites is ascribed to Avicenna. In operating with stones the bearer of the gem should be free from all pollution in order to secure a good result, a magic commonplace.

The owl.

If the heart and right foot of an owl are placed upon a sleeper's breast, "he will tell whatever he has done and whatever you ask him."[2] "And this was tested experimentally by our brothers recently."[3] No dog will bark at a person who carries these same parts of an owl in his armpit, and together with an owl's wing they will attract all sorts of birds to a tree where they are suspended.

Evax and Aaron, and the crow.

It is interesting to note that Evax and Aaron, who were cited in Albert's *Minerals,* are here cited for the virtues of animals as well, the crow, taxo, and hare.[4] Their crow story, however, also concerns a stone. If a crow's eggs are cooked and then replaced in the nest, the bird flies away to the Red Sea and returns with a stone whose touch turns the eggs raw again. This stone is valuable to human beings for other purposes. Set in a ring with the usual laurel leaf, its touch opens closed gates and frees prisoners from their chains. If one puts it in one's mouth, one can understand the language of the birds. One manuscript[1] speaks of this procedure with the crow's eggs as an experiment of a master Dacus, rather than of Aaron and Evax, and says that the stone brought by the crow aids conception. To have a male child the stone should be held in the right hand; in the left, for a female.

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[1] This last clause occurs in the printed text, but not in all MSS. Digby 147, for instance, omits it.

[2] In Sloane 342, fol. 131v, "will make him tell everything he has done, even though you don't ask him."

[3] *Liber aggregationis,* III, 147, "Et hoc a nostris fratribus expertum est moderno tempore"; Digby 37, fol. 53r, Digby 147, fol. 112r, and Digby 153, fol. 178r, "Et hoc a nostris fratribus certissime expertum est moderno tempore"; Sloane 3281, fol. 20v, "Et hoc a fratribus nostris percepi examen." The expression is also used in the account of the hoopoe (*upupa*) in Digby 37, and Digby 147.

[4] *Liber aggreg.,* II, "In libro mineralium in Aaron et Evax multa similia alia invenies." This passage is omitted in Sloane 351 and 3281. Sloane 351 does not cite Evax and Aaron for the following crow story, but Sloane 3281 does. Sloane 342 ascribes the crow story to Dacus, but cites Aaron concerning the taxo and Evax and Aaron concerning the hare.

Observance of astrology.

Astrological conditions had to be observed in some of the procedure already recounted. In conclusion the general principle is also laid down apart from any particular recipe, that to work a good effect one should operate under the influence of a benevolent planet like Jupiter or Venus, and to work an evil effect under a malevolent planet. "Whoever observes this rule correctly will without doubt find truth and the greatest efficacy in what we have said, as I have experienced with our brothers."[2]

Emphasis upon experiment.

This last expression and others like it which have been previously noted, together with the title, *Experimenta Alberti,* attest the experimental character of our treatise, which is to be classed as one of those "books of experiments" or "experimental books" which we have heard so often mentioned and of which our next two chapters will especially treat. This expression and its fellows further remind us—perhaps are intended to remind us—of Albert's allusions to the personal experiences of himself or his *socii* in his undisputed works. If our treatise is not by Albert, there can at least be little doubt that it pretends to be a product of his experimental school among the Dominicans at Cologne.

De mirabilibus mundi is more theoretical.

The *Marvels of the Universe* contains more theoretical discussion of much the usual scholastic sort than the *Experiments,* and so approximates rather more nearly to the form of most of Albert's works. As against the brief introductory paragraph of the *Experiments,* the *Marvels* enters upon a long and learned preliminary discussion of the validity, causes, and principles of magic before beginning its list of particular marvels.

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[1] Sloane 342, fol. 131v.

[2] Arundel 251, fol. 35r, and the printed text, which adds a few further words.

How account for magic?

The author states that after he knew "that the work of the wise man is to make marvels cease" by scientific explanation of them, he searched the writings of authorities until he understood the causes of most marvelous works. One extremely marvelous thing, however, continued to puzzle him, yet its existence he regards as evident to all men, even the vulgar. This was the binding of men by incantations, characters, sorcery, words, and by many quite common objects. For this he could find no sufficient cause and it seemed impossible. But after he had puzzled long, he found a plausible statement by Avicenna in the sixth book of the *Naturalia* that there exists in the human mind a certain power of altering objects, and that other objects obey the human mind when it is aroused to a great excess of love or hatred toward anyone of them. In such circumstances manifest experience shows that the mind can bind and alter objects as it desires. The author, however, for a long time remained still incredulous. But when he came to read books of necromancy and images and magic, he found in them this same theory that the human soul can alter its own body or exterior objects, especially if its influence concurs with a favorable astrological hour. Moreover, men differ in their natural capacity to influence others or to be influenced by them. Some men cannot be bewitched; others cannot be freed from the power which another has established over them; still others can both be bewitched and set free from sorcery.

Action of characters explained.

The discussion then turns for a time from magical influence in general to that of characters in particular. Their force depends upon the power of the mind of the operator and the celestial virtue at the time of their construction. A distinction is made between characters written blindly in a frenzy and those constructed scientifically with some likeness to the object sought, as when embracing figures are placed in a love charm. Such scientific characters our author prefers as more rational and possessing greater virtue. He states that later he will list from various books particular characters and words for making or destroying this or that.

Incredible "experiments of authorities" upheld.

Resuming his more general discussion, the author defends "the many experiments of authorities,"—a phrase which should warn us against attempting sharply to distinguish between medieval trust in authorities and medieval experimental tendencies. Some deem these "experiments of authorities" incredible, but he supports them as "most certain science." His argument therefor is the too subtle and ingenious plea that surely no philosopher would purposely write such apparent falsehoods, unless he were sure of their truth, since even an ignorant man does not willingly write what is manifestly false. Hence these seemingly incredible statements must be true.

Laws of nature and of magic.

The author then lays down some general laws of nature such as that every species seeks its kind, fire moving toward fire, and water toward water. Also that an object is gradually changed into likeness to its surroundings. Thus Avicenna says that an object turns to salt when it has stood in salt for a long time; and if wild animals remain long with men, they become domesticated. Philosophers have discovered "the dispositions of natural entities," such as heat, cold, boldness, wrath, fear, sterility, the ardor of love, or any other virtue. For instance, audacity is a quality innate in all members of the lion species. Knowledge of these innate qualities is of great assistance in marvelous and secret operations. Another great law is that like loves like. Medical men, alchemists, and scientists generally verify this assertion. Furthermore, "every nature, particular or general, has a natural friendship or enmity for some other, and some have this for the entire species and for all time, while others have it for an individual only and for a fixed time." Proof of this is to be seen in the case of certain animals who hate each other in life and whose parts, even whose hairs, retain this repugnance after death. Thus the lion's skin injures all other pelts; while sheepskin is consumed by wolfskin, and a drum made of the latter silences one made of the former.

Man's magic power.

The author then returns to the magic power in man. He believes that it is clear to everyone that man is the end of all nature and should be supreme over it. Man possesses all the marvelous virtues to be found throughout the natural world; even the demons obey him; "and in the very human body all the secret arts are worked and . . . every marvel issues from it." All these powers, however, are not found in one man at the same time, but in different individuals at different times. The details of this relationship of man to the world of nature are revealed not by reason but by experience,—a Galenic and Albertine distinction of which the author of the *De mirabilibus mundi* is quite fond.

A wonderful world.

Everything in nature is equally full of marvelous virtue. Fires are not more marvelous than waters, the virtues of pepper are no greater than those of jusquiam. One cannot dispute this, whether one attributes marvelous virtues primarily to the action of heat and cold, or to love and enmity between things, or to the influence of the stars, for all things in nature are subject alike to these three forces. Now, "when philosophers realized that everything was wonderful, they began to experiment and to bring forth what there is in things."

The chief causes of marvels.

The author, for his part, cannot agree with those philosophers and medical men who have tried to explain everything in terms of hot and cold, dry and moist. He declares that they met with many phenomena in the course of their experience which they could not verify upon this basis, so that "they marveled and were sorrowful incessantly, and often denied something although they saw it." On the other hand, our author does not agree with the astrologers that everything can be explained by the course of the stars. He prefers the view of "Plato and Aristotle and the orthodox (*legitimi*) and all who pursue the ultimate philosophy" that there are diverse causes or channels of marvelousness (*mirabilitas*). Often marvels are produced by the impression of the stars, often by heat and cold, often by the virtues of demons and necromancers, often by virtues innate in objects and implanted with their substantial forms, often by the relationship of things to one another. This is why Plato says *in libro tegimenti* (or, *regiminis*) that one who is not trained in dialectic, natural science, astrology, and necromancy—"in which are revealed the immaterial substances which dispense and administer all that is in things for good or for evil"—can explain neither what the philosophers have written nor what the senses perceive, and will depart sadly, unable to solve the problems of the marvelous. Our author also warns his readers to distinguish between the effects, often contrary, of substance and accident, and to remember that action is sometimes direct, sometimes indirect.

Marvels proved by experience, not by reason.

Finally, before beginning his list of specific marvels, the author reverts to his point concerning reason and experience, citing the *liber tegimenti* again to the effect that some things for which we can give no reason are nevertheless manifest to the senses, while others which we perceive by no sense or sensation are manifest to the reason. As usual the power of the magnet is adduced as an example of things proved by experience for which reason cannot account. "So no one should deny what the philosophers have affirmed from experience until he has tested it in the manner of the philosophers who discovered it." It is also pointed out that many of the ancients told marvelous things which are now verified and generally accepted. "And I will tell you some in order that you may strengthen your mind on them and be prepared to believe what reason cannot confirm." With this the list of particular marvels opens.

At first authorities are cited a good deal; philosophers in general, Galen, Hermes, the Arabian medical writer *filius Mesue* or Yuhanna ibn Masawaih,[1] the Pseudo-Aristotle

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[1] Strictly speaking, he seems to have been a Christian who served the caliph and died at Cairo in 1015. His existence has been questioned, as Arabic works do not mention him, so that some regard him as a Latin creation of the eleventh or twelfth century. His works were printed at Venice in Latin in 1471, 1484, 1495, 1497, 1513, 1523, 1568, and 1623. Some distinguish an earlier writer

Borrowing from the *Liber vaccae* of Pseudo-Plato suggested by the authorities cited.

and Alexander, whose feat is mentioned of killing the vipers with the deadly glance by erecting mirrors for them to look themselves to death in. Less familiar names are Architas, Belbinus—who, however, is perhaps the same as the Belenus of the *Speculum astronomiac,* Tabariensis, a *Book of Decoration,* and the books of Archigenes and Cleopatra, two authors cited by Galen. These same names of authors, with precisely the same statements cited from each and with a similar preceding argument about proving marvels by experience, occur also in the *Liber vaccae* or *Liber aggregationum anguemis* or *Liber institutionum activorum,* ascribed to Plato and Galen,[1] and of which we shall treat in a subsequent chapter. As this *Liber Anguemis* seems to have been known to William of Auvergne and to date back in Latin translation to the twelfth century, the *De mirabilibus mundi* would seem to have copied from it, especially as its citations of *Plato in libro tegimenti* (or *regiminis*), which I suspected had some connection with Galen before

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(c 777-857) of the same name, known also as John of Damascus, whose *Aphorisms* and some fragments are extant.

[1] The following passages, for instance, are identical in Digby 71, where the *Liber vaccae* occurs at fols. 36-56, and in the printed text of the *De mirabilibus mundi* (page references are to the Amsterdam edition of 1740). Printed text, p. 176, "Filius Mesue in lib. de animalibus. Si induit vestimentum viri mulier foeta, deinde induat ipsum vir priusquam abluat ipsum, recedit ab ipso febris quartana. . . . Et in libro de Tyriaca Galieni . . ."; also the tale of Aristotle and Alexander killing vipers by letting them stare themselves to death in mirrors: all found in the same order in Digby 71, fol. 37v.

Printed text, p. 177, "In lib. decorationis, accipe quantitatem fabae de alcihi et infunde ipsam in urinam mulae et da mulieri ad potandum, non concipiet": Digby 71, fol. 37v, gives the same recipe but cites "liber de conceptione" for it; however, for another recipe, "accipe mirram et line pollicem . . . nisi solum modo te" it too, fol. 38r-v, cites the Liber decorationis.

P. 177, "In libro Cleopatrae, quando mulier accipit omni mense de urina mulae pondera duo et biberit, ipsa non concipiet"; p. 184 from same, "si mulier non delectatur cum viro suo, accipe medullam lupi de pede sinistro et porta eam et nullum diligit nisi te"; both at fol. 39v.

P. 178, "In libro Archigenis, quando cor leporis suspenditur super eum qui patitur cholicam, confert": fol. 38r.

Pp. 181 and 184, citations from Tabariensis opening, "si suspenditur lapis spongiae in collo pueri . . ." and "si lingua upupae suspendatur super patientem": fols. 38v and 39v, "Tagiarensis."

Pp. 182 and 183, citations from "Belbinus" opening, "quando accipis albumen ovi . . ." and "qui posuerit portulacam super lectum": fol. 39r, "Belleg," but the margin says "Belenus."

I became acquainted with the *Liber Anguemis*, may be meant for that work, of which both Plato and Galen are reputed authors. It should be noted, however, that these citations and the passage introductory to them are entirely absent from one manuscript [1] of the *Liber vaccae* or *Liber Anguemis*.

Contents of the *Marvels* characterized.

In the specific marvels ligatures and suspensions are employed to a large extent, as are parts of animals: the skin of a wolf or dog, the blood of a hare, bird, bat, or male turtle, the urine of a mule, and the wax from a dog's left ear. There are a number of cures for quartan fever and some for other diseases, and various methods are recommended to prevent conception. The philosophers are represented as saying that if flies are submerged in water, they appear dead, but if they are buried in ashes, they will rise again. *The Book of Cleopatra* advises a husband whose wife does not love him to wear the marrow from a wolf's left foot, "and she will love none but you."

A mixture of chemistry and magic.

Toward the end of the treatise authorities are no longer cited and many of the recipes aim at magical or optical illusions and the fabrication of marvelous candles, lights, and combustibles. Some are perhaps akin to modern fireworks and chemical rather than magical. They terminate at any rate with a recipe for Greek fire and other explosives, including perhaps gunpowder. Instructions are given how to make men appear headless or with three heads or with the face of a dog or the head of an ass or any animal you wish, or in the form of angels or black men or elephants and great horses. Also how to write letters which can be read only at night, how to make a chicken or other animal dance in a dish, how to make the whole house seem full of snakes, how to make oneself seem on fire from head to foot, how to cast an object into the flames without burning it, how to enable men to walk through fire or carry a hot iron uninjured, how to extinguish a lamp by opening the hands over it and how to light it by closing them. Other recipes enable one to catch birds in the hands, to ward off dogs and snakes, to break a love charm, to loose bonds, see the future in sleep, catch a mole, and force a confession from a woman. To make a man forever a eunuch one should give him a glow-worm in drink. "And they say that if anyone is anointed with ass's milk, all the fleas in the house will gather on him."

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[1] Arundel 342 (14th century), fols. 46-54, whose Incipit does not occur in Digby 71 until fol. 40v, after all the citations in the preceding note; see Chapter 65, Appendix I, for a more detailed description of the MSS of the *Liber vaccae*.

Two specimens of combustibles.

The following is a specimen of the more superstitious type of recipe for a candle or combustible. From the first part of the human head, called *sinciput* by the philosophers, worms are generated soon after death. After seven days the worms become flies and after fourteen days they are great dragons whose bite is instantaneously fatal to man. "If you take one of these and cook it with oil and make a candle of it with a wick of crape, you will thereby behold with great fear a great thing and indescribable forms." In contrast to this recipe may be quoted one of three for making "flying fire" out of sulphur, charcoal, and saltpeter. "Take a pound of sulphur, two pounds of willow charcoal, six pounds of saltpeter. Grind them very fine on a marble stone. Then put some in a cover of flying-paper or thunder-making paper. The cover for flying should be long, thin, and well filled with that powder, but for thunder-making short, thick, and half filled. Here we would seem to have gunpowder and fireworks described.

Further discussion of marvelousness in general.

In three of the four *incunabula* editions of the *De mirabilibus mundi* which I have examined there occurs toward the close of the treatise another passage discussing marvelousness in general, most of which is not contained in the later editions although they briefly indicate its main point. The author says that now he understands that a thing is marvelous only as long as most persons cannot detect its cause, and that when a sufficient cause for it is shown, everyone ceases to wonder at it. He then distinguishes three kinds of marvels: first, those of rare occurrence in which not only is the cause unknown but the phenomenon itself marvelous from its very rarity; second, those whose cause is unknown, although the phenomena are neither new nor unusual; third, those whose cause is not entirely unknown but seems insufficient to account for the result. To produce any marvelous effect the requisites are a strong agent and a well-disposed material or patient. Sometimes, even when the agent is weak, the unusual aptitude of the patient compensates for this. On the basis of this scholastic generalization the author goes on to advise that, in working any marvel in the presence of the vulgar, one should center their attention upon some weak factor which alone is manifestly insufficient to produce the desired result and conceal the other contributory factors in the experiment as far as possible.

The *Marvels* is an experimental book.

If the *Marvels* is a more theoretical treatise than the *Experiments,* it is none the less almost equally experimental in character. Its particular marvels are also put in the form of experiments, and even in the more scholastic and reasoned introduction and conclusion the author, as we have seen, constantly appeals to experience, and closely associates experimentation and magic by such phrases as "all the marvelousness of experiments and marvels." He also employs the verb *experimentari* as well as the classical form *experiri,* thus suggesting definitely that he means "to experiment" and not merely "to experience." The *De mirabilibus mundi,* in fine, as well as the *Experimenta Alberti,* belongs to the category of "books of experiment" or "experimental books" which we have heard William of Auvergne and the *Speculum astronomiae* mention, and to which our next two chapters will be further devoted. Some of the items of the *De mirabilibus mundi* will be found duplicated or closely paralleled in these other experimental books, as we have already noted in the case of the *Liber vaccae* or *Liber Anguemis,* and as Berthelot, in editing *The Book of Fires* of Marcus Grecus, noted that a number of its experiments were found also in the *De mirabilibus mundi.*[1]

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[1] Berthelot (1893), I, 91.

De secretis mulierum.

With the later editions of the *Liber aggregationis* and *De mirabilibus mundi* there was usually published a third treatise ascribed to Albertus Magnus which had already been printed separately, namely, *The Secrets of Women.* I am not quite sure whether this treatise was put on the *Index Expurgatorius* because it had become too popular, or whether its popularity was increased rather than diminished by this official censure. At any rate the number of extant manuscripts shows that it was well known before the *Index* was ever instituted. Possibly one reason for questioning the authenticity of the two treatises which we have just considered was the ill-repute into which they came in consequence of being so often bound with the *De secretis mulierum.* Also its history and the question of its genuineness or spuriousness may throw some light, if only by way of illustration and analogy, upon the same problem in their case. Moreover, if the *De secretis mulierum* is by Albert or one of his disciples, it affords some further illustrations of the belief in occult virtue and astrology of himself or his pupils; and if not, it at least shows what a great interest such doctrines had for a large number of readers during the centuries from the fourteenth to eighteenth inclusive. It is not, however, either a book of magic or an experimental book like the two treatises which we have just considered.

The problem of its authorship.

The Secrets of Women was printed before 1500 [1] and in all has appeared in about as many editions as the other two treatises. Choulant counted over thirty editions of each.[2] The *De secretis mulierum* is found in several manuscripts, chiefly of the fourteenth century, in the medieval collection of Amplonius at Erfurt, and in numerous other manuscripts at Munich, Berlin, Wolfenbüttel, and Vienna.[3] Apparently

[1] Albertus Magnus, *De secretis mulierum,* Heinr. Knoblochtzer, Strasburg, 1480. Also at Rome, 1499; and an edition dated 1428 by mistake for 1478; and an undated edition where it is entitled *De secretis mulierum et virorum.* I have used the 1480 edition and the one of Amsterdam, 1740, where it is bound with the other two works ascribed to Albert and with Michael Scot's *De secretis naturae.*

[2] *Janus,* I (1846), p. 152, *et seq.;* cited by Meyer (1855), IV, 78.

[3] For a list of the MSS see Appendix II at the close of this chapter.

the treatise originated in Germany, whether by the hand of Albert or not, and remained a favorite there. A translation into German was made for the Count Palatine of the Rhine.[1] Although sometimes no author is named in manuscripts of the *De secretis mulierum,* in the case of those of Amplonius of the fourteenth century one infers from Schum's descriptions that the work is ascribed to Albertus Magnus and to no one else. Thus no support is given by these early manuscripts to the theory of Simlerus, Meyer, and Borgnet that the treatise should be attributed to Henry of Saxony, a disciple of Albert whose writings contain many excerpts from Albert's, because in some old printed editions the work is assigned to him.[2] This ascription to Henry of Saxony has already been well characterized by V. Rose in his Catalogue of the Latin manuscripts at Berlin as "a pure invention of the editor" [3] of the printed edition of 1499, which the manuscripts clearly contradict. Thomas of Cantimpré, who devotes some chapters of his *De natura rerum* to gynecology has also been suggested as author of the *De secretis mulierum,* but for no further reason.[4]

Its citation of Albert, commentary, opening.

Perhaps the best reason for doubting the authenticity of *The Secrets of Women* is that Albert seems to be cited in it, a point already noted by Albert's biographer, Peter of Prussia,[1] towards the close of the fifteenth century. It is, however, somewhat difficult to distinguish the text of the original treatise from that of a commentary upon it which both accompanies and envelopes it in both the manuscripts and printed editions. In this commentary Albert is often cited but apparently he also is cited in the text proper, from which, however, the commentary after a time ceases to be adequately distinguished in those copies which I have examined.[2] Possibly this commentary is by Henry of Saxony or perhaps it is the commentary by Buridan mentioned in one of the manuscripts.[3] It states that Albert composed the treatise at the request of a priest (*sacerdos*), and the text itself opens with a salutation "To his dearest friend and associate in Christ," after which ensues a divergence, due no doubt to the carelessness of copyists, as to the name or initial letter of the cleric in question, as to his place of residence, and as to his ecclesiastical rank or position.[4] But he appears to have been a clerk from Erfurt who was studying at Paris. The text is in the form of a letter to this clerk and the author states that it is written "in part in physical and in part in medical style." He asks the clerk not to reveal it to any depraved person and promises to send him further writings, "when providence permitting I have toiled further in the art of medicine." [5] This fact that the *De secretis mulierum* is addressed to a clerk who seems to be studying at Paris suggests that in the fourteenth century bibliography of writings by Dominicans the title, *Determinationes quarumdam questionum ad clerum Parisiensem,* as well as another title, *Secretum secretorum Alberti,* which are ascribed to Albert, may refer to our treatise, although the exact title, *De secretis mulierum,* does not appear in the bibliography.

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[1] Wolfenbüttel 2659, 16th century, fols. 1-51, Albertus Magnus de secretis mulierum in der deutschen Bearbeitung des D. Hartlieb, gewidmet dem Herzog Sigmund, Pfalzgrafen bei Rhein, mit Index.

[2] This is also suggested by the old catalogue of Royal MSS at Paris in connection with BN 7148, 15th century, whose contents are described as "♯ 1. Alberti Magni sive potius Henrici de Saxonia Alberti Magni discipuli de secretis mulierum, ♯ 2. Anatomia totius corporis eodem authore," etc.

The MS itself, however, affords no ground for this attribution to Henry of Saxony. On its cover is written in crowded medieval letters and with abbreviations, "De secretis mulierum alberti, Anathomia secundum albertum, Expositio de lepra." In the text itself this last is stated to be a gloss on Avicenna's work on the cure of leprosy by master Albert "de sangaciis" or "de zanchariis" of Bologna, a doctor of the philosophical faculty. There seems, however, to be nothing to connect his name with the two preceding treatises which respectively open: "Incipit liber de secretis mulierum secundum Albertum magnum," and "Incipit Anathomia tocius corporis secundum Albertum Magnum." A Nicolaus has signed his name as scribe or copyist of the *Anatomy* and *De lepra.*

[3] V. Rose (1905), p. 1238.

[4] Ferckel (1912), pp. 1-2, 10.

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[1] Petrus de Prussia (1621), p. 159.

[2] Rose, however, was of the opinion that Albert was repeatedly cited in the text proper as well as the gloss.

[3] Amplon. Quarto 299, end of 14th century, #7.

[4] See Appendix II for the wording in the various MSS. In the edition of 1480 the form is, "Dilecto sibi in Cristo socio et amico N. clerico de tali loco verae sapientiae et augmentum continuum vitae habentis. . . ."

[5] BN 7148, fol. 1r, "cum arte medicinali prolixius insudavero domine concedente."

Nature of its contents.

The Secrets of Women scarcely deserved to be placed on the Index aside from the suggestiveness of its title and perhaps the fact that it had become too popular. Meyer, while regarding it as spurious, rightly remarked that it shared the common medical knowledge of the time and displayed a strong astrological superstition, but was neither immoral nor indecent.[1] As a matter of fact, its astrology is little more extreme than what we have found in Albert's undisputed works. The article upon him in the *Histoire Littéraire de la France*[2] declared that *The Secrets of Women* was certainly not by him, but added that he makes very similar statements in his commentary on the fourth book of the *Sentences,* where he justifies such knowledge on the part of a priest as essential to his comprehension of what he is liable to be told in the confessional. This fits in nicely with the statement that Albert composed the *De secretis mulierum* at the request of a priest.

Medieval standards in such matters.

The Secrets of Women may seem indecent judged by modern standards, but so do many discussions of sexual matters by monastic recluses, theologians, and church fathers of the distant past. Peter of Prussia, Albert's fifteenth century biographer, although concerned to establish the saintly character of his hero, did not question the authenticity of the *De secretis mulierum* on grounds of indecency but thought it "useful and necessary to know the facts of nature, even if indecent."[3] In the thirteenth century itself we find a number of Latin works which are very similar to *The Secrets of Women.* There is *The Secrets of Nature* by Michael Scot and *The Adornment of Women*[4] by Arnald of Villanova, a physician of the closing thirteenth century who also wrote on Antichrist, advocated religious reform, and gave moral and religious exhortation as well as medical care to his royal patients in Sicily and Aragon. This *De ornatu mulierum* was described by the *Histoire Littéraire de la France* as "one of Arnald's most curious treatises, containing very informing details concerning the arts by which medieval women corrected the faults of nature or repaired the ravages of age. But we say no more on this point. We would not venture the vaguest allusion to the contents of some paragraphs. They taught publicly in the middle ages things which respectable persons do not know and do not wish to know."[1] Those who are offended at the idea of the blessed Albert's discussing such matters in the thirteenth century should read the highly vivid, realistic, and matter-of-fact account of male sexual passion in the *Causae et curae* of St. Hildegard,[2] the mystic and ascetic, the abbess and prophetess, in the twelfth century, in which work it follows a long and circumstantial account of the process of conception and generation.[3] Or they might note in a sixteenth century manuscript at Paris that an oration by John Antony Alatus, doctor of physic, royal and apostolic knight, delivered when he was chosen orator to Pope Innocent, is immediately followed by a *Book of the Secrets of Women* by the same author.[4] Of another thirteenth century work which attained extraordinary popularity in almost every European language and which was most appropriately entitled, *De omni re scibili et quibusdam aliis*—"Of everything knowable and then some," the *Histoire Littéraire* says,[5] "The mysteries of generation engage its attention more than anything else; like *Timeo* it is very detailed upon this point and often borders upon obscenity." A fourth work, *The Secret of Philosophers,* written in French by someone who at least pretends to be a priest and doctor of theology, is also full of unprintable passages upon sex and generation, and yet shows also, according to the *Histoire Littéraire*,[1] the spirit of scientific philosophy.

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[1] Meyer (1855), IV, 79.

[2] HL XIX, 373.

[3] Petrus de Prussia (1621), p. 165.

[4] A treatise with the same title is attributed to a doctor of both laws, Antonius de Rosellis, in Canon. Misc. 6, 15th century, fols. 79-91, "Explicit tractatus brevis sed utilis super ornatu mulierum editus a domino Antonio de Rosellis utriusque juris doctore eximio." In this case, however, the discussion would appear to have been more abstract, judging from the opening words, "Queritur primo utrum ornatus mulierum secundum morem patriae, qui videtur vanus et superfluus."

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[1] HL XXII, 74-75. Not even this censorious description has seduced me into reading the treatise itself, but I suspect that it would turn out to be not nearly so bad as this mid-Victorian, if I may apply the adjective to a French work of corresponding date, passage would have us believe.

[2] Ed. Kaiser (1903), p. 71.

[3] *Ibid.*, pp. 59-70.

[4] BN 3660A, #10 and #11. If Alatus discoursed to Innocent VIII on this theme, he might be accused of bringing coals to Newcastle.

[5] HL XXXI, 296.

Some superstitious recipes.

Our treatise contains some superstitious recipes akin to those of the *Liber aggregationis* and *De mirabilibus mundi*. To prevent conception for a year women are advised to drink salvia cooked with wine for three days; or to eat a bee, "and she will never conceive." If hairs of menstruating women are buried in rich soil where ordure lies in winter time, the sun's heat will generate a long and strong serpent there the following spring or summer. To tell if the child will be male or female one should pour a drop of the mother's milk or blood into pure water from a clear spring. If the drop goes to the bottom, the child will be a boy; if it floats on the surface, a girl.

Astrology.

Astrology, however, is more prominent in this treatise than such magical modes of divination. We are told that "all the virtues which the soul comprehends in the body it draws from the supercelestial spheres and bodies."[2] From the farthest sphere come the powers of being and moving. From the sphere of the fixed stars the foetus receives its individual personality. From the sphere of Saturn, the virtue of discerning and reasoning; from that of Jupiter, magnanimity; from that of Mars, animosity and irascibility; from the sun, the power of learning and memorizing; and so on. We are also told how each planet, starting with Saturn, rules for a month the formation of the various physical members of the child in the womb, and the fact that the heart is formed during the fourth month under the rule of the sun is regarded as disproving Aristotle's assertion that the heart is generated first of all the members. The influence of each planet at birth is also recorded, and we hear of "the influences of the planets, whom the ancients called gods of nature, over man's body and soul."[2] Also that man's intellectual power is not from matter but from the sky. Saturn's child is dark, hairy, well bearded, false, malicious, wrathful, gloomy, wears unkempt clothing, and so forth. The influences of the twelve signs are also considered, and the *magnus annus* with its repetition of history and Socrates reliving his life in the same old Athens. The author also declares that divine sacrifice, immolation of beasts, and the like cannot be removed from the action of the celestial bodies which mete out life and death, which perhaps suggests that even religion and prayer are under the stars. Monstrous births, such as twins with separate heads and hands but one trunk and pair of feet, are ascribed to some special constellation.

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[1] HL XXX, 567-93.

[2] Edition of 1480, biiiir.

[3] *Ibid.*, ciiiiv, "super hominem ex parte corporis et animae."

Citations of Albert and Avicenna.

Albert is cited, perhaps by the commentator, concerning twins of whom one had such virtue in his right side that all bolts and locks on that side of him were opened, while the virtue of the other's left side closed all open doors. This was due not only to a special constellation but to a special disposition of matter to receive its influence. Peter of Prussia (Cap. 12) cites the same passage from Albert's *De motibus animalium.* Other citations of Albert in the *De secretis mulierum* are one from a treatise on the sun and moon and the assertion that a child was born with organs of either sex *ita quod potuit succumbere.* Avicenna is credited with having stated in a book on deluges that a flood might come and drown all living creatures, but that the virtue of the sky would generate others.

APPENDIX I

MANUSCRIPTS OF THE EXPERIMENTS OR SECRETS

In the British Museum

Sloane 342, 13th century, fols. 130-131, Experimenta fratris Alberti de ordine Praedicatorum. Text incomplete.

Sloane 3281, end of 13-14th century, fols. 17r-21v. Expliciunt secreta fratris Alberti coloniensis de ordine fratrum predicatorum.

Additional 32622, early 14th century, fols. 84v-95r, Experimenta Alberti.

Arundel 251, 14th century, fols. 25r-35v, Expliciunt experimenta Alberti magni. This Explicit, written in enormous letters, is misplaced, as the *Experiments* of Albert really end at fol. 35r and fol. 35v is devoted to the twelve experiments with snakeskin translated by John Paulinus or John of Spain.

Egerton 2852, mid 14th century, fol. 67-, Experimenta Alberti.

Sloane 3564, end of 14th century, fols. 34-38, Jocalia Salamonis, is really part of our *Experiments,* covering twelve herbs.

Sloane 3545, 15th century, also contains a passage on twelve herbs which seems to be a portion of our *Experiments.*

Royal 12-B-XXV, 15th century, fol. 248r-, Incipiunt experimenta naturalia fratris Alberti que dicta sunt secreta philosophorum et primo de herbis. Text incomplete.

Sloane 351, 15th and 13th centuries, fols. 25r-38r, Incipit liber Alberti de diversis experimentis . . . / . . . Expliciunt experimenta Alberti.

Additional 30351, later 15th century, fol. 69-, Experimenta Alberti de herbis.

Sloane 2320, 16th century, fols. 65-69, what the catalogue describes as "De arte magicali tractatus" turns out to be Albert's experiments with herbs.

For the contents of the treatise I have not had time to use all these MSS, but have checked the printed editions to a considerable extent by Sloane 342, 351, and 3281, Arundel 251, and Royal 12-B-XXV; and have also examined the three following Digby MSS at the Bodleian.

At Oxford and Cambridge

Digby 37, 14th century, fols. 46-55r, "Expliciunt Secreta fratris Alberti de Colonia, ordinis fratrum praedicatorum, super naturis quarundam herbarum lapidum, et animalium."

Digby 147, 14th century, fols. 107-113v, "Secreta fratris Alberti de Colonia, ordinis fratrum Predicatorum super naturis quorundam herbarum et lapidum et animalium efficacia in diversis libris philosophorum reperta et in unum collecta."

Digby 153, 14th century, fols. 175-179, "Secreta fratris Alberti ordinis fratrum Predicatorum."

Bodleian 177 (Bernard 2072), late 14th century, fol. 30r-32v, an incomplete text.

CU Trinity 1351, late 15th century, fols. 33-39 (unfinished).

In Continental Libraries

Berlin 968, 14th century, from England, fol. 298-, "Incipiunt secreta Alberti Coloniensis de ordine predicatorum. . . . Expliciunt secreta Alberti Coloniensis de ordine predicatorum."

Bologna University Library, MS 135, 14th century, fols. 25r-31r, "Albertus Magnus, Liber aggregationis seu liber secretorum."

Library of the Dukes of Burgundy, 5275, 14th century, Alberti Teutonici, De tredecim herbis, "Sicut dicit philosophus . . ."; 10872, 16th century, Alberti Magni Secreta, "Occurrit ante mihi . . ." which is not the usual Incipit.

Wolfenbüttel 2650, 14-15th century, fols. 202 (or more likely 206, as a portion of the de plantatione arborum seems to have been confused in the catalogue of Heinemann with the Secreta) -213, "Expliciunt secreta Alberti de Colonia super naturis quorundam animalium, herbarum et lapidum in diversis libris philosophorum respersa. Deo gratias."

Clermont-Ferrand 171, 13th century, 129 double column leaves, following fol. 1, de sensu et sensato, fol. 24, de morte et vita, and fol. 29v-116, "Explicit septimus liber vegetabilium," comes at fols. 116-19, "Secreta fratris Alberti Coloniensis (seu de Saxonia, adds the modern catalogue) de ordine Fratrum Predicatorum. Sicut dicit philosophus in pluribus locis / aliquid utilitatis inveniat. Expliciunt secreta." Then follows Albert's Meteorology.

CLM 453, fol. 197, Alberti Magni experimenta de herbis lapidibus et animalibus expliciunt quae a graeco et arabico in latinum transtulit.

CLM 444, 14-15th century, fol. 197-, Alberti Magni experimenta de herbis, lapidibus et animalibus.

APPENDIX II

MANUSCRIPTS OF THE DE SECRETIS MULIERUM

Amplon. Quarto 15, early 13th and beginning and middle of 14th century, partly from Italy, partly from Münster, and partly from Erfurt, fols. 72-83, Libellus Alberti de secretis mulierum, "Dilectissimo in Christo socio et amico R. de tali loco B. talis loci rector. Cum vestra favorabilitas. . . ."

Amplon. Quarto 234, first half 14th century, fols. 41-53, Libellus domini Alberti de secretis mulierum, "Dilecto sibi socio et amico G. de tali loco clerico camerario loci litteraliter rector salutem. . . ."

Amplon. Octavo 79, 1341-1350 A. D., fols. 1-12, de secretis mulierum Alberti Magni. "Dilecto sibi in Christo socio et amico clerico Erphordie Io. de Villa Parisiensi." V. Rose comments on this last, "Ioh. Parisiensis ist bekanntlich ein Mädchen für alles!"

Amplon. Quarto 157, early 15th century, fols. 213-6, libellus de secretis mulierum; fols. 227-68, Commentarius de hoc libello scriptus. The former opens, "Dilectissimo amico et clerico de tali loco Iohannes sanctorum talis loci. Cum vestra favorabilitas."

Amplon. Quarto 299, end of 14th century, #7, Commentary of Jean Buridan on the De secretis mulierum.

Amplon. Quarto 342, late 14th century, fols. 14-15, Abbrevacio de secretis mulierum.

BN 7148, 15th century, fol. 1r-, "Incipit liber de secretis mulierum secundum Albertum magnum. Precordialissimo sibi in Christo socio et amico er. clerico erfordensi n. scolaris Parisius vere sapiencie necnon huius mundane continua incrementum. Cum tua favorabilitas."

Berlin 976, 1419-1420 A. D., fol. 218-, "Dilecto sibi in Christo socio et amico renoldo dilecto de tali loco Albertus scholaris(?) talis loci vere sciencie et vite(?) presentis mundane in Christo ieshu continua incrementa(?). Cum vestra favorabilis ac gratuita rogavit societas ut quedam vobis de hiis que apud mulierum naturam et condicionem sunt occulta et secreta librum manifestem preclarius."

Berlin cod. lat. quarto 385.

Wolfenbüttel 698, 14th century (1382, 1391 A. D.), fols. 12-13.

Vienna 2466, 14th century, fols. 150r-158v.

Vienna 3287, 15th century, fols. 77-87, cum commento.

Vienna 5315, 1436-1444 A. D., fols. 147-206.

Vienna 5500, 15th century, fols. 1-37v, a commentary on the De secretis mulierum.

Bodleian Library, Bernard 2063, contains an "Expositio libri Alberti Magni de secretis mulierum."

CLM 8484, 15th century, fol. 159-.

CLM 14170, 15th century, fols. 60-96.

CLM 14654, 15th century, fols. 95-142, cum commento.

CLM 21107, 15th century, fols. 46-71, cum commento.

CLM 22297, 14th century, fol. 22-, "Secreta mulierum completa Herfordie anno 1320," fol. 43-, laudatur Alberti tractatus de menstruis mulierum.

CLM 22300, 13th century, fols. 61-76, de secretis mulierum, vel Liber generationis.

CLM 23789, 15th century, fols. 94-143, Liber de secretis mulierum ad Nicolaum clericum Erfordiensem directus, cum commentario.

CLM 14574, 15th century, fols. 1-40, Aristoteles de secretis mulierum cum praefatione Philippi interpretis ad Guidonem de Valencia, is presumably the pseudo-Aristotelian Secret of Secrets and not the De secretis mulierum at all.

CLM 444, 14-15th century, fol. 208-, Alberti de ornatu mulierum secundum totum corpus, is possibly our treatise, although it may be the work of that title by Arnald of Villanova.

CHAPTER LXIV

EXPERIMENTS AND SECRETS OF GALEN, RASIS, AND OTHERS: I. MEDICAL AND BIOLOGICAL

Books of "Experiments" or "Secrets"—Rasis on pains in the joints—*Medical Experiments* of Galen or Rasis—Value of such medical experiments—Experimenters of many lands and cities—Who was the Latin translator?—*The Secrets of Galen*—Addressed to "friend Monteus"—Was he William of Saliceto's "friend Montheus"?—Patients and prescriptions—*Liber medicinalis de secretis Galieni*—Rasis *On sixty animals*—Eberus *On the virtues of animals*—Galen and Honein *On plants*—*Secrets* or *Aphorisms* of Rasis—A literal translation of its preface—Contents of its six chapters—*Experimentator*—*Experiments* of Nicholas of Poland and Montpellier—His *Antipocras*—Other works of Nicholas—Appendix I. The manuscripts of the *Medical Experiments*—Appendix II. The manuscripts of *The Secrets of Galen.*

Books of "experiments" or "secrets."

In this chapter we continue our examination of the pseudo-literature current in the twelfth and thirteenth centuries by considering and distinguishing one from another a number of books of "experiments" or "secrets" which are mainly medicinal in character, although some are concerned especially with the properties of animals, and most of which are attributed either to Rasis or Galen or to both of them. Some were included in the early printed editions of their works, others are found frequently in medieval Latin manuscripts. Some of them perhaps really are by Rasis or have some connection with his works. In the next chapter we shall go on to books of experiments primarily of a chemical and magical character but some of which also are ascribed to Rasis or Galen.

Rasis on pains in the joints

It is essential to distinguish these various treatises from one another rather carefully, because a number of different writings are ascribed to Galen or Rasis under the common title of "Book of Experiments" or words to that effect.[1] Thus Gilbert of England, a medical writer of the first half of the thirteenth century, cites "the expert experiments from Galen's book of experiments" for the statement that ammonia is a remedy for pains in the joints,[2] while a fifteenth century manuscript at Berlin, containing various extracts from medical works, cites "a certain experimenter of whom Rasis writes in the book of experiments, 'He cured many afflictions by simple medicines.' "[3] We may first note that the title *Liber experimentorum* or *Experimenta Rasi* is sometimes applied to what is probably a genuine work of Rasis,[4] namely, the treatise *On diseases of the Joints* (*De egritudinibus juncturarum*), which appears in both early printed editions of Rasis' works.[5] I think that this treatise sometimes is found alone in the manuscripts,[6] but more often it is followed by, or run together with, as if they formed a single work, another treatise or portion of a treatise which more properly deserves the title, *Book of Experiments.*

Medical Experiments of Galen or Rasis.

This is the book of medicines tested by experiment or of medical experimentation [7] or of experiments of the altar. It constantly talks about experimenters and its contents are arranged as experiments. The work opens with the statement that the fire which descended upon the altar burnt the books of the king or kings, and with these numerous medical works, including some which the author himself had begun to compose. This faintly suggests the fire of 192 A. D. mentioned by Galen which destroyed the shrine of Peace and the libraries on the Palatine hill and the first two books, which had already been published, of his own work on compound medicines. It might therefore seem that the present treatise is that of a forger trying to pass himself off as Galen, and in the printed text of 1481 and many manuscripts this opening statement is introduced by the words, "Said Galen." In other manuscripts there is no such mention of Galen and the treatise is ascribed to Rasis, like the work on diseases of the joints which so often precedes it. Between these two works there often intervenes a brief treatise or chapter on the medical treatment of children (*Practica puerorum* or *parvorum*). Where the *Medical Experimentation* comes to an end is not easy to determine. It might seem to be brought to a close by a sentence reading, "Said Galen"—or, "Says Rasis"—"Now we have said our say in this book which we call the book of the experimental testing of medicines, which we have proved and have received from wiser men." But after some further lines of text, which scarcely seem the beginning of a new treatise, we meet in some editions or manuscripts with an "Explicit" or "Expliciunt experimenta Galenis," while in others the text proceeds without a break, although this sentence occurs, "Now moreover, of those medicines we have mentioned in this treatise many tested by experience, but if we acquire yet others, we will write them at the end of this treatise." This would seem to indicate that the work is not yet finished. The text then often continues, as we have said, discussing such matters as "How to take medicine without nausea; marvelous pills according to Rasis," "Medicines which beautify the face," "The composition of many oils," soporifics invented by Rasis to cure his own insomnia brought on by too intense application to the medical art, and other remedies for varied complaints. In the 1497 edition of Rasis' works, which does not contain the *Medical Experimentation* proper, most of this supplementary material was combined in four chapters under the separate title, *The Antidotarium of Rasis,*[1] although that title apparently belongs to another work, while a passage on the stone was also printed as a distinct *Tractatus Rasis de preservatione ab egritudine lapidis.* But in the 1481 edition and such manuscripts as I have examined these chapters or paragraphs are not separated from the *Medical Experimentation,* and the whole finally ends, "Expliciunt experimenta rasis." Possibly, therefore, everything that we have noted so far, beginning with the *Diseases of the Joints,* should be regarded as part of a composite treatise by Rasis, whose name occurs most often and prominently. If so, it is a very omnibus work and loosely hung together, nor when its parts are found together are they always in the same sequence.

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[1] For instance, the following 14th century MSS at Munich and Paris contain *Experimenta* ascribed to Rasis along with his *Divisiones, Antidotarium, Synonyms,* etc. CLM 13045, fol. 143; 13114, fol. 247; BN 6902, 6903, 6904, 6906. It is necessary to examine the MSS to tell what the work or works thus designated may be, which I have been unable to do in the case of the MSS at Munich. It is also impossible to tell what *Experimenta* of Rasis are meant in numbers 1227 and 1229 (James) of the medieval catalogue of St. Augustine's, Canterbury. Other extant MSS which cannot be identified from the notices of them in the catalogues are: Wolfenbüttel 479, 15th century, fols. 304-16, Experimenta Rasis, and 3175, 15th century, fols. 181v-6v, Experimenta magis famosa et magis usualia ex libro experimentorum generali Rasis; Vienna 2364, 14th century, fols. 153-73, Rhasis, Experimenta, and 2387, 14th century, fols. 137-9, quaedam experimenta translata a "Guirardo."

[2] Gilbertus Anglicus, *Compendium medicinae,* Lyons, 1510, fol. 328v.

[3] Berlin 908, fol. 62.

[4] In the Arabic list of 232 titles ascribed to Rasis published by Ranking (1913), numbers 17 and 18 are works on gout.

[5] Milan, 1481; and Bergamo, 1497.

[6] Apparently so in CLM 12, 15th century, fols. 277-84; which, however, I have not personally examined. The opening words of the *De egritudinibus iuncturarum* are, "Dicit Rasis volo in hoc capitulo dicere medicinas que sunt necessarie in doloribus iuncturarum."

[7] See Appendix I for a list of the MSS of it.

Value of such medical experiments.

If we consider that portion which may be described as the *Medical Experimentation* proper, we find that the Pseudo-Galen, or whoever he is, goes on to say that he does not grieve so much over the loss of other books in the fire as he does concerning some medical experiments which were there and which he had acquired from certain good experimenters (*a quibusdam bonis viris experimentatoribus*). For a single one of those experiments he may have had to give in exchange several good experiments of his own or perhaps a considerable sum of money. Sometimes a man may make a fortune and get a name for great learning by knowing just one experiment which will cure a single disease. Such men are very reluctant to impart their secret to others and sometimes it dies with them. Having thus secured the reader's sympathy, attention, and interest, the author discloses the fact that, despite his losses in the fire which descended upon the altar, he still has some experiments left. He affirms that he has composed the present work of medicines tested by his own experience or received from good medical men, and that he does not fill up his book with familiar remedies like tyriac and opiates, but introduces medicines whose existence is generally unknown.

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[1] At fols. 98v-101v: cap. 1, "De aptitudine medicinarum ut sine horribilitate possint sumi secundum rasim pillule mirobalanorum"; cap. 2, "De medicinis que ornant faciem"; cap. 3, "Compositio multorum oleorum"; cap. 4, containing remedies for various complaints, opens, "Summa istius capituli. Post electionem specierum instrumentorum" and ends, "cum sirupo cit(r?)oniorum." But in both the edition of 1481 and St. John's 85, fol. 176v, recipes to induce sleep are headed "Chapter Three."

Experimenters of many lands and cities.

Our author then proceeds to list one medical compound after another, giving its ingredients and method of preparation, its effects on various parts and processes of the human body, and the diseases which it cures. Sometimes he explains the properties and operation of each constituent. He usually gives the name and city of the experimenter from whom he received the prescription, but these proper names are difficult to decipher, as they vary in the printed editions and manuscripts [1] and are often abbreviated and probably misspelled in both. Thus "the experiments of Yrini pigami romani" are perhaps the same as "the experiments of Urcanus Romanus" which Gilbert of England cites for some pills for sciatica.[2] However, we seem to read of Sacon or Socion, "the greatest of Greek medical men," whose experiments our author gets from his disciples; of Gargeus or Agarges, who was the lord of all the wise men of his time; of Cateline, physician to King Lithos; and of other physicians and medicines from Egypt, Macedonia, and Sicily. Often a number of experiments are taken from a single authority; eleven from Gereon the Greek which our author has put to the test and found to be truly marvelous; thirty by Athaharan, an experimenter of the city of Abthor, some of which our author apologizes for as well known; three compound and thirty simple medicines by Achaason, an experimenter of the city of Athens; twenty from Zeno of Athens, a great physician whom our author says he had never seen because not contemporary with him, but that his master had seen him and got good experiments from him and passed them on to our author who has proved them oftentimes and found them true. Our author especially esteems the physicians of the altars, who are reputed superior to other medical practitioners because they cure by means of the sacrificial meats. Of a medicine which he received "from an Egyptian stranger," he exclaims that it has not its like and that this stranger had it from one of the physicians of the altars. These allusions suggest that our author is a pagan, perhaps a Sabian like Thebit ben Corat, rather than a Mohammedan or Christian, but are perhaps a dodge of the forger like his opening allusion to the fire which descended on the altar—suggestive of fire-worship in Rasis' own Persia.

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[1] For instance, the first compound is described in the 1481 edition of Rasis as "ab afloīa experimentatore qui erat de civitate teriste," while in Arundel 115 we read "ab astarō experimentatore qui erat de civitate tetith."

[2] *Compendium medicinae* (1510), fol. 328v.

Who was the Latin translator?

In several manuscripts [1] the treatise which we have just been discussing is ascribed to Galen rather than Rasis and is said to have been translated from Greek into Arabic by John or Johannitius, that is, by Honein ben Is'hak or Hunain ibn Ishak, or Hunayn ibn Ishaq, a Christian Arab who died in 873,[2] and from Arabic into Latin by a Franchinus or Farachius or Ferranus or Ferrarus or Frarthacius. Steinschneider [3] has explained the spellings, Franchinus, Farachius, Faragut, Fararius, and Ferrarius, as all applying to

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[1] See Appendix I. Unfortunately I have not seen these particular MSS.

[2] E. G. Browne (1921), pp. 24-26, repeats some good stories concerning Hunayn ibn Ishaq from al-Quifti and the Fihrist, and says (p. 26) "Generally, as we learn from the Fihrist, Hunayn translated the Greek into Syriac, while (his pupil) Hubaysh translated from Syriac into Arabic, the Arabic version being then revised by Hunayn, who, however, sometimes translated directly from Greek into Arabic. All three languages were known to most of these translators, and it is probable, as Leclerc suggests, that whether the translation was made into Syriac or Arabic depended on whether it was primarily designed for Christian or Muslim readers."

Concerning Honein see further Suter (1900), pp. 21-23.

[3] Steinschneider (1905), p. 14. In Virchow's *Archiv,* XXXIX (1868) 317-23, he holds that a prologue by Farachius opening, "Friend, may God grant you noble morals," should precede the *Incipit,* "Said Galen, 'The fire that descended,'" but in the next chapter we shall find reason for believing that this prologue belongs rather with the *Liber Vaccae,* also ascribed to Galen and Honein.

Faradj ben Salem, a Jew of Girgenti who was connected after 1279 with Charles of Anjou as a translator. This Jew, commonly called Faragius or Feragius in the Latin manuscripts, translated the *Continens* of Rasis[1] and the medical treatise entitled *Tacuinum Dei.*[2] But can he be identified with the Ferrarius whom De Renzi[3] classed among the medical writers of the school of Salerno and whose works are found in a manuscript dated as early as the twelfth century?[4] Also our treatise would seem to have been translated into Latin by the first half of the thirteenth century, since there are several manuscripts of it from that century, and since Gilbert of England cites either it or the Rasis on pains of the joints which regularly accompanies it. Perhaps Faragius made a re-translation, apparently not an uncommon occurrence in the medieval period. It is also worth recalling that Peter the Deacon listed among the works translated by

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[1] In two Vatican MSS of the 14th century, Urbin. Lat. 237 and 239, are respectively books i-xi and xiv-xxv of the *Elhâwi* (*Elhauy*) of Rasis, which Feragius or Faragut is said to have translated from Arabic into Latin at the mandate of King Charles at Naples. "Explicit translatio . . . facta de mandato excellentissimi regis Karoli . . . per manus magistri feragii Iudei filii magistri Dalem de aggregendo (Salez de Agrigento) . . . die lune xiii februarii septimae indictionis apud Neapolim." The variant readings in parentheses are from two 15th century volumes of 537 and 471 double columned leaves respectively which form MS 1091 in the library of the University of Bologna.

[2] Ed. J. Schott, Strasburg, 1532. The work divides into two parts, *Tacuinum morborum* and *Tacuinum sanitatis.* MSS are numerous but often anonymous: Vienna 2322, 13th century, 26 fols.; Bologna University Library 389, 14th century, 43 fols.; etc. In two Oxford MSS of the 14th century, Magdalen 102 and Corpus Christi 65, and in Vendôme 233, 15th century, fol. 81, the work is said to have been translated from Arabic into Latin "by the hands of master Faragius for King Charles." But in S. Marco XIV, 50, 14th century, it is said to have been translated under Manfred (1258-1266), "Liber Tacuini translatus de arabico in latinum in curia illustrissimi regis Manfredi scientiae amatoris." The Arabic original, *Taqwímu's-Sihha,* was written by Ibn Butlán who died about 1063 A. D.

[3] *Collectio Salernitana,* 1852-1859, I, 363, 369.

[4] Library of the Dukes of Burgundy (Brussels) 4567, 12th century, Ferrarii, Tractatus de medicina, opening, "In tractatu nostro primo videam." But perhaps the MS is dated too early in the catalogue of 1842. In Digby 197, 13th century, fols. 57-69, opening "Febris ut testatur Jo (annitius) est calor innaturalis," and closing, "in qua bullierint ar. dragna (?) liquir, et succus eius. Expliciunt febres M. Ferrarii feliciter," may be another translation from Honein. Coxe says that there is another copy of it among the MSS of All Souls College.

Constantinus Africanus a *De experimentis*. Can this have been the treatise ascribed to Galen or Rasis, and can Franchinus and the other names possibly be corruptions of Africanus? But this is not all. Just as Galen and Rasis have ascribed to them both medical works and works of alchemy, so one manuscript contains "Extracts from the treatise on the art of alchemy of brother Ferrarius," who, like that other friar inclined to alchemy, Roger Bacon, "directs his letter to the Pope." [1] Nor do these extracts seem to agree with the treatise in alchemy of Efferarius which has been printed,[2] although he too is described as a monk who addresses *apostolicum quendam*.[3] Probably, however, the same alchemist is meant in both cases, but it also seems probable that in general there was more than one writer named Ferrarius. But from the perplexing problems of who was the translator of the *Medical Experiments* and of the identity or different personality indicated by Ferrarius and other similar names let us turn to another work attributed to Galen.

The Secrets of Galen.

The Secrets of Galen, or *The Book of Secrets*, is a treatise which seems to occur with fair frequency in the manuscripts [4] and has also appeared in print.[5] It is perhaps most found with other works of Galen, but also occurs in manuscripts containing experimental books, and in particular the *Medical Experiments* of Galen or Rasis just considered, or in manuscripts with other works of Rasis. Gerard of Cremona is often mentioned in the manuscripts as the translator of the work from Arabic into Latin, and such a translation is included in the list of Gerard's works drawn up by his associates soon after his death.[6] At the close of the treatise occurs this statement: "Says Hunayn, son of Isaac, 'This is what we have found from the books (or, book) of Galen for the use of the religious, and it is more glorious and blessed than his other books, and of aid, so that if another book were lost, I could supply it from this one.'"[1] This statement seems to indicate that this treatise, like the *Medical Experiments,* had first been translated from the Greek to the Arabic by Honein ben Ishak, or perhaps rather that Honein, who was a Christian Arab, has made a compilation of extracts from the works of Galen for the use of persons of religion.

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[1] Digby 164, early 15th century, fol. 17, "Extracta de tractatu fratris Ferrarii super arte alkymie. Dirigit epistolam suam Papae et primo ponit artis impedimenta." The same MS, as a matter of fact, contains (fols. 8-12v) Bacon's letter on the secret works of art and nature and the nullity of magic.

[2] *Verae alchimiae doctrina*, Basel, 1561, pp. 232-7; also in Zetzner, *Theatrum chemicum*, III (1613), 128-37.

[3] Steinschneider (1905), p. 14.

[4] They will be found listed in Appendix II to this chapter.

[5] In the edition of Galen's works of Venice, 1609, VIII, *Spurii libri*, fols. 101v-108v.

[6] Boncompagni (1851), pp. 3-4, following Cod. Vatican 2392, fols. 97v-98r.

Addressed to "friend Monteus."

The opening words of the treatise are: "You have asked me, O friend Monteus, to write you a book on the cure of diseases in accordance with experimental medicine and rational considerations from those numerous cases which I have wisely tested of good men of religion in the service of the king (or, in the observance of the Faith)."[2] That these remarks are not the preface of a translator but the words of the original author is indicated not only by the fact that in at least one manuscript[3] they are called, "The words of Galen," but also by the fact that, after the writer has made a few general medical observations and allusions to his other writings on the elements, on aid to the limbs, on members and accidents, and on compound medicines, he again addresses "brother Montheus" under the caption, "Words of Galen commending his book." [1] Montheus is now told that "this is the book of great assistance which I composed in medicine, for I have tested all its contents many times in similar constitutions." Galen, or whoever the writer may be, regards this treatise as supplementing and rectifying his work on compound medicines. In yet a third passage "friend Monteus" is told of an "alcohol" which keeps the eyes in good condition which the writer has used.[2]

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[1] The Latin of the sentence reads in BN 7046, 13th century, fol. 54v, as follows, except that in parentheses variant readings are added from Balliol 231, early 14th century, fol. 45r, in Roman type, and from Berlin 166 (Phillips 1672) 14th century, fol. 34, in italics.

"Inquit hunai (hunayn, *ymahin*) filius ysaac. Istud (id, *illud*) est quod invenimus ex li. (libris, *libris*) utilitatis religiosorum (religiosioris) galieni (Gal') et est gloriosioris benedictionis quam libri eius alii et iuvamenti (Berlin 166 omits *et iuvamenti*) quod si ceciderit alius liber ab isto transferam (transferrem) ipsum."

Berlin 166 then adds another sentence: "Quamcunque medicinam non dixi in hoc meo libro queratur in antidotario Unaym filii ysaac et illic invenietur," which indicates that Honein regards the *Secrets* as his own book and more than a mere translation of Galen.

[2] "Rogasti me, amice montee, ut scriberem (describerem) tibi librum in medicatione egritudinum secundum experimentum medicinale et consideraciones rationales ex eis que expertus sum in multis sapientum religiosorum bonorum in cultu regis (legis)."

[3] Berlin 166.

Was he William of Saliceto's "friend Montheus"?

But here occurs a difficulty, for we find William of Saliceto, the noted Italian surgeon of the thirteenth century, opening his work on surgery with the words, "My intention is, friend Montheus, to publish for you a work on manual operation in order to satisfy the petition of our associates." [3] It would therefore appear either that William's work on surgery is a mere translation of some earlier treatise, or that William is also largely responsible for the so-called *Secrets of Galen,* and that he has throughout added new material and remarks of his own to those of Honein and the genuine or pseudo-Galen. This would not surprise us, for we have evidence that he was not the first to take such liberties with the work of Galen and Honein. Moses Maimonides, the Jewish writer of the twelfth century, says in his Aphorisms that in the treatise of Hippocrates on diseases of women, upon which Galen commented and which Johannitius translated, he has found many interpolations of a marvelous character "which some other person than Johannitius wrote and some other person than Galen expounded." [4] But it would be difficult to explain why our treatise in the manuscripts is quite generally said to have been translated into Latin by

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[1] Reminding us of "the prologue of a certain doctor in commendation of Aristotle" in *The Secret of Secrets.*

[2] BN 7406, fol. 49r; Balliol 231, fol. 40v.

[3] See the following MS at Venice, S. Marco XIV, 58, 14th century, fols. 41-93, Mag. Guillelmi de Saliceto, chirurgiae tractatus quinque. "Propositum est, amice Monthee, tibi edere librum de operatione manuali ut satisfactio respondeat peticioni sociorum. . . ."

[4] From a Latin translation of the Aphorisms of Moses ben Maimon printed in 1489 (number IA. 28878 in the British Museum), Particula 24.

Gerard of Cremona, while William of Saliceto is never mentioned.

Patients and prescriptions.

The *Secrets* describes the writer's treatment of such ills as stupor and chills, frenzy, headache, sore eyes, white growths in the eyes, earwigs, earache, bones stuck in the throat, nosebleed. His patients are likewise regularly mentioned and include old men of seventy and young men of twenty, one of the sons of the kings, a king's daughter, "a man from the kings of Alexandria," and another "man from kings," orators, and "a man from one of the villas of the Romans" who was troubled with sciatica. He also describes pills for pains in the joints which he made for his young friend Glaucus,[1] a philosopher of Beneventum.[2] But he tells especially, as he had been asked to do, of his prescriptions for monks and ascetics, both men and women, who had ruined their health by their austerities.[3] Be he Honein or Gerard of Cremona or William of Saliceto, the writer has no false modesty and says of his "alcohol" for the eyes, for instance, "This is the last word, and a great secret." His recipes, however, are the usual sort of compounds and are limited to medicinal purposes, so that there is no reason for us to dwell upon them further.

Liber Medicinalis de Secretis Galieni.

From its title one might think that a *Medicinal Book of the Secrets of Galen* in an Oxford manuscript[4] would turn out to be the same treatise as the foregoing, but upon examination it is found to consist chiefly of the medicinal virtues of animals and parts of animals, beginning with man. The names of the animals are given in a foreign language, which is probably meant to be Arabic, and the text is accompanied by a series of spirited little miniatures of the animals in the margin, ending with the transmarine eagle. The work rather resembles that of Sextus Placitus on medicine from animals which precedes it in this manuscript and which we have discussed in an earlier chapter.[1] The closing chapters of our text deal with the four humors. The superstitious and fantastic uses to which the parts of animals are put is indicated by the opening words of the treatise, "Bind on the tooth of a dead man."

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[1] In the same MS, Balliol 231, fol. 389v, is Galen's *Ad Glauconem nepotem suam* (desinit in libro VII).

[2] "Et eius regio benevetiti"; this suggests Gerard of Cremona or William of Saliceto rather than Honein.

[3] This feature of the treatise reminds one somewhat of the treatise *On Melancholy* ascribed to Constantinus Africanus, see above, I, 752.

[4] Rawlinson C-328, 15th century, fols. 147r-154v, "Liber medicinalis de secretis Galieni. Dens hominis mortui ligetur . . . / . . . alterius studiosus perpendet."

Rasis *On sixty animals.*

A very similar work on sixty animals is ascribed to Rasis in the 1497 edition of his works, and Albertus Magnus cites "the book of sixty animals" to the effect that the flesh of the dog is hot and dry.[2] In reality in the treatise as it has reached us, only fifty-six animals are discussed, the first being the lion, and the fifty-fifth and fifty-sixth, man and woman.[3] Most of the animals treated are equally familiar, but some names have been left in Arabic. The work does not describe the animals and their habits, still less draw moral lessons or spiritual illustrations from them, but limits itself to their medicinal properties, or in a few cases, such as ants or mad dogs, to remedies against their bites. Much of the contents is of the same sort as Pliny's discussion of the medical virtues of parts of animals, but the few authorities cited are Arabic or Greek,—Aristotle, Dioscorides and Galen. The work is very superstitious. With the right eye of a hedgehog and other ingredients an eyewash is made which is supposed to enable one to see in the dark, while if the left eye of the same animal is fried in oil and a little of it inserted in a person's ear on the point of a stylus, he is supposed to drop off to sleep at once.[4] Eating a frog is recommended as a restraint upon sexual passion and upon conception.[1] It is said that everyone will be terrified who enters a house that has been sprinkled with the water in which the animal called *iaroboath* has been drowned.[2] If a man's tooth and a hoopoe's wing are suspended over a sleeper, he will not awake until they are removed.[3] To cure tertian or quartan fever one places on the back of one's neck with the left hand a powder made of a spider who has been captured while in the act of catching flies, pulverized, and stored in linen.[4]

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[1] See above, Chapter 26.

[2] *De animalibus*, XXII, ii, 18, "Dicitur autem in libro sexaginta animalium quod caro canis calida est et sicca."

[3] In the table of contents of the printed edition of 1497 the work is spoken of as "De proprietatibus iuvamentis et nocumentis sexaginta animalium"; in the page headings it is briefly called, "De sexaginta animalibus"; but at the opening of the work itself we read, "Liber Rasis philosophi filii zacharie de proprietatibus membrorum et de utilitatibus et nocumentis animalium aggregatus ex dictis antiquorum secundum quod probaverunt antiqui, et continet sermones 56."

A "liber Rasis et diascorides de naturis animalium" is listed in the fifteenth century catalogue of MSS of St. Augustine's Abbey, Canterbury.

[4] Cap. 23.

Eberus *On the virtues of animals.*

Very similar to, indeed perhaps in large measure identical with one or the other of the two foregoing treatises or with the *De medicina ex animalibus* of Sextus Placitus, judging from the description of it given by Valentinelli, is a work on the virtues of about seventy animals in a manuscript of the fifteenth century at Venice.[5] Like the work of Sextus Placitus it opens with "the little beast which some call the *taxo*."

Galen and Honein *On Plants*

To Galen was ascribed not only the work on the occult medicinal virtues of animals already noted, but also a like treatise on plants.[6] It was translated from the Arabic into Latin by *Grumerus Iudex de Placentia* (Grumerus, a judge of Piacenza) and Master Abraham the physician, and is in the form of a Gloss or Commentary by Honein ben Ishak or Johannitius, whom we again encounter as the translator or adapter of Galen from the Greek. Honein states that Galen's wish in this work was to set down some medicines of marvelous properties which he had collected in the course of his lifetime, and which Honein too has often put to the test, "and experience never fails." These medicines are not commonly known, because Galen wished them divulged only to men of wisdom and discretion. Others, however, before Honein have translated the treatise from Greek into Arabic, and a preceding glossator has dealt with it in a way of which Honein does not approve and which he intends to rectify, including only what is true and what he has himself tested. Forty-six specimens are then treated, of which a few are stones or parts of animals rather than plants.[1] Honein's gloss is mainly devoted to explaining what plant or tree Galen had in mind in each case, or, where Galen does not give an exact name, to stating its Arabic equivalent. In a few cases the opinion of Abraham the Jew is briefly added.

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[1] Cap. 30.

[2] Cap. 33.

[3] Cap. 36.

[4] Cap. 54.

[5] S. Marco XIV, 45, written in 1467, fols. 1-56, Eberi de virtutibus animalibus, opening, "De virtutibus quae sunt in animali quod dicitur taxus vel thaximus." Valentinelli, V, 119, infers that the author's name is Eberus from the statement at fol. 29, "at haec est quam ego Eberus probavi."

[6] In the Venice, 1609 edition of Galen's works, VIII, *Libri spurii*, fols. 120-22, Galeno adscriptus liber de plantis . . . per dominum Grumerum Iudicem de Placentia et per magistrum Abraham medicum de Arabico in Latinum Marsiliae translatus . . . Glossa Humain, idest Ioannitii filii Isaac.

Secrets or *Aphorisms* of Rasis.

To Rasis is attributed not only a work on animals much like that ascribed to Galen; there also is a *Book of Secrets in Medicine* printed under his name.[2] But to avoid confusion with the two books of secrets ascribed to Galen, we shall henceforth speak of Rasis' treatise by its alternative title of *Aphorisms*. The following is a literal translation of its preface, interesting for its attitude to science and books, and both original and at the same time occasionally a bit incoherent and abrupt or strange and mystical in tone. Perhaps these characteristics are to be partly accounted for by awkwardness of the Latin translator in grappling with the Arabic, or, if we assume that the work is by Rasis, to the coming on of old age, or perhaps they are merely the mystic and boastful style characteristic of pseudo-literature.

A literal translation of its preface.

"I have collected and classified diseases, and I have shown cures and the natures of cures from the canons of the ancients and from treatises and chapters to the best of my ability; and I beseech God to supply me with the additional strength and power to complete this book and make it a useful one. Already we have completed a compilation of things tested by experience in the arts, namely, philosophy and physics, two subjects in which words and facts are infinite. And men can never make an end of those subjects (*Nec etiam homines in eis complementum habere possunt.*) But our intention in this book is to show things useful to humanity. And in this we differ from the ancients who hid things that were essential to know and deprived of light the path of science and virtue. And witness to this point is our big book of divine science, which is the Book of Spirituals, and our book Of the Spirit. And our discussion in the Book of Diets, namely, how indulgence may be removed from these for all time. And I have condensed the language so that one can get to the point more easily. And I expect retribution from God who will furnish me aid. For without Him nothing has effect."

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[1] See 32) *lapis qui vocatur generans aquilcum,* 34) *lapis demoniacus,* 35) the liver of a bird, 36) the brain of a bird, 40) *lapis Indaicus,* 43) *piscis qui vocatur provocator menstruorum,* 46) asphalt.

[2] In the edition of 1481 it occupies 21 pages, "Liber rasis de secretis in medicina qui liber amphorismorum apellatur," and divides into six chapters: I) de pronosticis rerum futurarum, II) de experimentis et confidentiis, III) de casibus qui ipsi rasi acciderunt, IV) de dietis medicinis et cibariis, V) de verbis ypocratis, VI) de scientiis et intellectibus sine quibus rectus medicus esse non potest.

"Says Abu Bekr: the wise man is not occult and in every age, despite frauds and concealments of the paths of science and of the ancient arts, compilers have collected their doctrines and discovered their ways whether hidden or manifest. And this book of ours is first and is secret and is handy. And show it not to undeserving persons. In it is contained reason, it adds something to the ancients, and as long as there shall be days and years I shall live and gain through this book of mine, and I have no doubt that this book of mine is something secret. For it has been my plan to tell some secrets in it, both in prognostics of the future and in confidential information and some of my own cases. Said confidences I acquired and collected from the books of sages who had not perfectly revealed them. And from what I have experienced myself and acquired by my reason. And witness thereof is my rational language, and I have spoken in collections of medicines and foods, and I want to strike a golden mean between these and free my words entirely from the accidental. And know that this is the pith of all utility and the pearl of clarity which brings light out of darkness. Which book the ancients would have praised had they lived till now, and I have divided it into six chapters without superfluity; with comprehensiveness and brevity I now begin to speak with my excessive virtue and occult science."

Contents of its six chapters.

The first chapter on prognostics deals with the weather as a sign or cause of disease and also with bodily symptoms. The next two chapters on experiments, confidences, and Rasis' own cases, contain some close resemblances to two treatises already described in this chapter, listing marvelous oils, plasters, confections, and suffumigations like the latter part of the *Experimental Medicines* of Galen or Rasis, making the same citations of Haly, and giving Rasis's prescription for his own insomnia; and also the alcohol (here spelt *alcofol*) for white growths of the eyes of the *Secrets of Galen,* which is again called "the last word" (*Scias quod hoc est ultimum*). The fourth chapter speaks of the great force of occult virtues in natural substances, the difficulty of measuring and comprehending such occult virtue, and the consequent need of moderation and caution in the use of medicines and the danger of rash experiment. The author's advice that "of medicines everyone should take less" was certainly sound amid the extravagances of ancient and medieval pharmacy. He gives an interesting list of drugs which may safely be employed.[1] The fifth chapter, after a brief introduction by Rasis, consists of the *Secrets* or *Prognosticon* of Hippocrates, which we have already met following or in the midst of the *Experimental Medicines* of Galen. The sixth chapter is a collection of miscellaneous aphorisms such as that in the practice of medicine "Laymen and those would judge by their intuition and young men who have not had practical experience are no better than murderers,"[1] and that "women who are accustomed to sleep a great deal on the right side will hardly bear a female child." In both the sixth and second chapters the need of a doctor's knowing astronomy and the importance of observing the planets and the moon are touched on. Appeals for divine aid and the rendition of thanks to God occur occasionally throughout the treatise.

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[1] "He sunt medicine salve cognite mirobolanis citrini kebuli belerici emblici fudi berberum, reubarbarum, draganti, gummi arabicum, aloes, acatia, cassia fistula terrantabin cinnamomum, amomum squinantum calamus aromaticus cos costus darsesahon tralacta mastix sandaraca karabe, lignum aloes, muscus, camphora, ambra, gariofilii sandali spodium faufel carui nanoti sethet nux mascata, bolus armenus, neikaberi, lapides sarri, ruzubet bezari thenet, lapis lazuli, lapis iacinthus. Sisimbrium, menta, almarda dux fumus terre fenigemisch seleni lilium album, lilium celi, nenufar celeste et palliodium aliothinum rose viole virgeris ladion idest oculus bovis, virga pastoris, iusquiamus. Iste sunt tres res medicinarum in quibus non evenit timor et si cum cera vel oepo vel zucharo misceantur, raro vel numquam egro lesionem efficiunt magnam. Numquam enim vidi vel audivi quod aliquis qui his rebus medicaretur magnam lesionem inferret egris."

Experimentator.

Withington states in his *Medical History* that Rasis was sometimes called *Experimentator.* Now among the many medieval "experimental books" was one which is cited simply as *Experimentator* by two thirteenth century writers, Petrus Hispanus, afterwards Pope John XXI, in his *Thesaurus Pauperum,*[2] a medical compendium of great popularity, and Thomas of Cantimpré in his encyclopedia entitled *De natura rerum.*[3] In his preface Thomas describes *Experimentator* as "a book without name of the author, which I have heard was compiled in modern times."[4] No manuscript of a work so entitled seems to be extant. The citations of Thomas and Peter from the work deal largely with animals, their habits and semi-human characteristics, and the virtues medicinal and otherwise of various parts of their carcasses. *Experimentator's* prescriptions included eating the heart of a wolf and the gall of a bear, taking a powder compounded of the burnt hoof of an ass, the ashes of a weasel, and swallows burnt alive, touching an aching tooth with that of a dead man, and even more disgusting remedies. Some of these suggest the *Sixty Animals* of Rasis, but it will be remembered that that treatise did not touch upon the habits of the animals but only their medicinal uses. Moreover, Peter of Spain cites herbs and other non-animal remedies from *Experimentator* for paralysis of the tongue, toothache, and constipation, while Thomas of Cantimpré repeats "the properties of air according to *Experimentator.*" Thomas does well to speak of the book as *compiled* in modern times, for many of its statements have a familiar sound and suggest use of such authors as Pliny and Marcellus Empiricus. For instance, Thomas cites *Experimentator* for the account found in Pliny's *Natural History*—and described by Pliny himself as an "experiment"—of marking a dolphin's tail in order to learn its age, if it should chance to be caught again. On the whole, if neither Peter nor Thomas knew who wrote the *Experimentator,* it is probably idle for us to make surmises, unless possibly it may have been by Thomas himself, whose authorship even of the *De natura rerum* is seldom recognized either in the manuscript catalogues or in the manuscripts themselves.

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[1] Layci et qui ex ingenio proprio volunt iudicare et iuvenes qui res non sunt experti interfectores existunt.

[2] See Chapter 58.

[3] See Chapter 53.

[4] Invenies etiam librum quemdam suppresso auctoris nomine quem modernis temporibus compilatum audivi cuius sententias ubicunque repereris ex hoc cognosces quod hoc nomen Experimentator subsequentibus invenies praelibatum.

Experiments of Nicholas of Poland and Montpellier.

Of medieval collections of experiments which are medicinal in character we may further include some which do not fall under the head of pseudo-literature but are ascribed to a writer of the thirteenth or early fourteenth century.[1] Such are "The Experiments of Brother Nicholas, a physician of Poland, who was at Montpellier thirty (or, twenty) years and who had such efficiency (or, was a man of so great experience) that neither before him is there believed to have been his like, nor is it hoped for the future, as is patent in his marvelous works in divers provinces and regions in easily expediting great and sudden cures." [2] Nicholas is here

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[1] Since on the one hand he cites "master Albert", while on the other hand there are several fourteenth century MSS of his work.

[2] Sloane 1754, 14th century, fols. 28r-30r, "Experimenta Fratris Nicholay de Polonia qui fuit in Monte Pessulano 30 annis," etc.

Berlin 166 (Phillips 1672), 14th century, fol. 21, "Incipiunt experimenta de animalibus fratris nicholai de polonia," etc. The variant readings in parentheses are from this MS.

CLM 534, 14th century, fol. 75, Experimenta fratris, etc., medici de Polonia qui fuit in Montepessolano.

Sloane 964, 15th century, fol. 82, "Experimentum M. Nicholai de Bodlys qui fuit de Monte pessulano."

St. Augustine's, Canterbury 1846 (now missing), Experimenta Nicholai de polonia.

Wolfenbüttel 3489, 14-15th century, fols. 83-135v, Experimenta magistri cancellarii de Monte Pesspoken of as "brother" because he was a Dominican friar. In one manuscript this Nicholas of Montpellier is further called "de Bodlys." Serpents are used a great deal in his experiments. Thus to break the stone in the reins or bladder he recommends that the patient drink a little "snake-dust" (*pulverem serpentis*) [1] in wine early in the morning and late at night. Or a pulverized toad or scorpion would be even more efficacious.

His *Antipocras.*

In one manuscript the *Experiments* of Nicholas are immediately followed by his *Antipocras* or *Book of Empirical Remedies.*[2] This work, in form a poem with a prose prologue, in content is in part an invective against the physicians of the Hippocratic school, who, whether on rational grounds or from motives of professional jealousy, have questioned the marvelous cures which Nicholas has wrought by unusual pills or drugs, or by external applications in rings and brooches. In part it is a listing of these empirical methods, ligatures and suspensions, employment of occult virtues and amulets, by means of which Nicholas asserts that he has wrought so many marvelous cures, and which he declares are based on repeated experiment and solid experience, whether they seem reasonable *a priori* or not. He assails the authority of Galen who said, "Physician, how can you cure, if you are ignorant of the cause?" He makes much of the doctrine of occult virtues in many things, and "more in despised than in precious and famous things." As authorities in his support he cites Tobias, Ptolemy, Hermes and "master Albert." The magnet, as usual, is brought forward as a proof of the existence of occult virtue.

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sulano, seems too long to be our treatise; more likely it is the same as BN 7056, Experimenta magistri Gilberti Cancellarii Montepessulani.

[1] I assume that the expression refers to the reptile itself reduced to a powder rather than to the dust which it has crawled over.

[2] Berlin 166, 14th century, fols. 23-26, "Incipit antipocras quem composuit et similiter noncupavit frater nicholaus fratrum predicatorum, alio autem nomine appellatur liber empericorum." I have not seen the MS, but follow the description by V. Rose (1893) I, 371-2.

In the 15th century catalogue of MSS in St. Augustine's Abbey, Canterbury, the Experiments follow the Antipocras in MS 1604, Collecciones Michael' de noragte. . . . Antipocras I liber empericorum fratris N. experimenta fratris N de polonia.

Other works of Nicholas.

A treatise entitled, *Fates of the Stars,* is ascribed to a Nicholas of Poland in a manuscript at Munich, but if the date given, 1477 A. D., be that of composing the treatise, the author is evidently too late to be our Nicholas.[1] Of chemical experiments attributed to some Nicholas we shall speak in the following chapter.

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[1] CLM 647, 15th century, fols. 51-71, Stellarum fata, anno 1477 per Nicolaum de Polonia. Diels and Sudhoff have engaged in controversy over the *Antipocras* of Nicholas of Poland, which Sudhoff published, *Archiv f. Gesch. d. Med.,* IX (1915) 31-52, and Diels republished, *Sitzb. d. Kgl. Preus. Akad. d. Wiss.,* (1916) pp. 376-94.

APPENDIX I

THE MANUSCRIPTS OF THE MEDICAL EXPERIMENTS

The *Medical Experimentation* is printed in the 1481 edition of Rasis but not in that of 1497. It also is found in old editions of Galen, such as that of Venice, 1609, VIII, Spurii libri, fols. 108v-113v; and that of Renatus Charterius, Paris, 1679, X, 561-70.

It occurs frequently in the MSS. In the following list I have endeavored to indicate the other treatises accompanying it, since they are perhaps all sections of one work. I note first those MSS which I have personally examined.

St. John's College 85, late 13th century, fol. 157v-, "Incipiunt experimenta rasi. Dicit rasis volo in hoc capitulo dicere medicinas que sunt necessarie in doloribus iuncturarum scilicet medicinas laxativas" . . . (the Incipit of the De egritudinibus iuncturarum): fol. 167r-, 'De experimentis altaris. Dixit G. quod ignis qui descendit . . ." (the Incipit of the De medicinis experimentatis): fol. 172v-, "De aptatione medicine ut sine horribilitate possit sumi secundum Rasim pillule mirabiles": fol. 178v, "Expliciunt experimenta rasis. amen dicant omnia." Steinschneider (1905), p. 12, was in error in describing the "experiments" of Rasis in this MS as alchemistic; nor do I understand why he said (1906), p. 47, "Ein medizinisches liber Experimentorum von Razi ist sonst kaum bekannt; wenn St. Johns Coll. 85 ein solcher enthält, so ist wohl der Titel neu," especially since he himself some pages later (1906), p. 85, associates with the name of Rasis a lib. Experimentorum in Wolfenbüttel 479, fols. 304-16.

Arundel 115, 1327 A. D., fol. 108v-, Practica puerorum; fol. 110-, Tractatus de iuncturis dolorum curatione; fol. 116v-, Liber experimentorum; fol. 121r- De aptatione medicine ut sine horribilate sumi secundum Rasim pillule mirabiles; fol. 125r, "Expliciunt experimenta rasys. deo gratias."

Sloane 1933, 13th century, fol. 99r-, Antidotarium of Rasis, some 50 or 60 chapters from diseases of the scalp to sciatica, opening and closing, "Iam quidem pervenimus ad expositionem resonis . . . / . . . imspissetur deinde repone. xplicit antidotarium rasi": fol. 105v-, "Incipiunt experimenta rasi. Dixit rasis volo in hoc capitulo. . . ." The MS is imperfect, if not mutilated: at fols. 111-12 it seems to run into the Practica puerorum and at fol. 114v stops in the midst of the De medicinis experimentatis.

BN 7046, 13th century, following the Divisiones and Antidotarium of Rasis come at fol. 157-, Rasis de iuncturarum egritudinibus; fol. 165-, Practica puerorum; fol. 169-, Experimenta seu ipsius seu Galeni.

BN 6906, 14th century, following the Antidotarium, at fol. 164r-, de iuncturarum egritudinibus; fol. 175r, "Explicit practica parvorum. Incipiunt experimenta;" fol. 188r, "Explicit experimenta rasis."

Other Paris MSS where the Diseases of the Joints and Medical Experiments are joined together as a single work are BN 6902, fols. 106-129v; 6903, fols. 75r-92r; 6904, fols. 141r-159v: all of the 14th century. In BN 6902, fol. 117r, the caption, "Here Rasis begins to tell various experiments which he acquired," precedes the usual Incipit of the Medical Experiments, "Said G(alen) Fire descended on the altar. . . ." In the other two MSS the usual Incipit occurs alone and there is no rubric or break in the text to mark it.

The following MSS I have not seen:

BN 6893, 14th century, #3 Rhazis experimenta de doloribus juncturarum; #4 Galeni liber de medicinis experimentatis sive experimentatio medicinalis e graeco sermone in arabicum a Johannicio et ex arabico in Latinum a Magistro Franchino conversa.

Balliol 285, 13th century, fol. 198, Liber Galieni de medicinis experimentatis qui intitulatur experimentatio medicinalis quem transtulit Johannes de Greco in Latinum (Arabicum?) et magister Farachius de Arabico in Latinum; Incipit, "Dixit Galenus ignis qui descendit. . . ."

CLM 372, 15th century, fol. 185-, Galeni liber . . . "experimentatio medicinalis" quem transtulit Johannicius de Greco in arabicum et mag. Ferranus de arabico in latinum.

CLM 666, 15th century, fol. 288-, Excerptum ex Galeni libro de medicinis experimentatis a magistro Ferraro translato.

CLM 19901, 15th century, fol. 209-, Liber Ga(leni) de medicinis experimentatus qui intitulatur experimentatio medicinalis quem transtulit Johannicius de Graeco in Arabicum et mag. Franthacius de Arabico in Latinum.

Merton College 228, 14th century, fol. 51-, Avicennae liber experimentorum, interprete Gerardo Cremonensi, but the Incipit shows it to be the De medicinis experimentatis, "Dixit Galienus; ignis qui descendit. . . ." It is interesting to note that it is preceded by the Divisiones of Rasis and followed by his work to Almansor, which are the only other treatises in the MS and are also said to be translated by Gerard of Cremona.

Amplon. Folio 260, 13-14th century, fols. 344-52, experimenta de doloribus juncturarum, fols. 355-66, Galieni experimentatio medicinalis (ab aliis Rasi attributa).

Amplon. Folio 265, early 14th century, fols. 111-19, liber experimentorum Rasis, fols. 121-26, de cura dolorum iuncturarum Rasis. It is unusual for the *Cure of Pains in the Joints* to follow the other treatise.

Berlin 899, 13th century, fol. 89-, Experimenta, or, De doloribus iuncturarum; fol. 96-, Liber G. experimentationis medicinarum. This MS also has the usual supplementary matter beginning with the "De aptatione medicine ut sine horribilitate possit sumi," etc., although just before this another hand has inserted the word "Explicit" and drawn a red line.

CU Trinity 1473, 15th century, fols. 116-31, Experimenta rasis, opens, 'Dixit rasis volo in hoc capitulo . . ." (the Incipit of the Diseases of the Joints), closes, " . . . per vias urinales" (the Explicit of Rasis' passage on the cure of the stone) "Expl. antidota." (over an erasure) "Rasi et cum hiis totus libellus Deo gracias."

Peterhouse 101, 13-14th century, fols. 98v-116, is like the MS just described, except that it closes ". . . per vias urinales. Expl. experimenta Rasis," and then follows the Antidotarium of Rasis.

CLM 3520, 14th century, fol. 61-, Liber experimentorum Rasis, fol. 63-, Medicinae Zenonis de Athenis, is presumably simply a part of the former, since it includes twenty experiments or recipes by Zeno of Athens.

CLM 13026, 14th century, fol. 1, Liber de secretis G(alen)i; but the Incipit, "Dixit G; ignis qui descendit . . ." is that of the Experiments.

Wolfenbüttel 2156, 15th century, fols. 427-35, Experimenta varia Rasis, Vsion Rision (qui erat de Armenia anteriori), Asariton, Anuleth de Macedonia, Acharaan de civitate Apthor, aliorumque medicorum. These seem to be some of the authorities cited in the Medical Experiments. The same MS also contains Rasis' Divisiones and a part of the Secrets of Galen of which we shall speak later.

Vienna 2306, 14th century, fols. 9v-15r, Pseudo-Galenus, De medicinis expertis.

Vienna 5336, 15th century, fols. 24-27, Liber de medicinis expertis, in fine mutilus.

APPENDIX II

THE MANUSCRIPTS OF THE SECRETS OF GALEN

I have examined the first two MSS in the list and derive the others from the descriptions in MSS catalogues. In the two which I have seen the mentions of Gerard are confined to the rubrics.

BN 7046, 13th century, fols. 48r-54v, Incipiunt secreta Galieni translata ab ysaac in omnibus egritudinibus. It follows the *Flores* of Avicenna and is followed by his *Summa Antidotarii* and by various works of Rasis including the *De juncturis* and *Experimenta* above mentioned. The table of contents indicates that the MS once contained other medical treatises including *Experimenta* of "Gilbert, chancellor of Montpellier."

Balliol College 231, early 14th century, a ponderous folio volume of Galen's works in Latin translation; of 26 items our treatise is #6 at fols. 39v-45r.

Peterhouse 33, 13-14th century Italian hand, fols. 186-92, Liber g. de Secretis Secretorum, "Rogasti me amice montane."

Chartres 284, 13th century, Galeni opuscula, fols. 251v-258, Secreta Galieni a magistro Girardo Cremonensi translata de arabico in latinum. Incomplete at the end.

Chartres 293, 14th century, Galeni opuscula, fols. 118-24, Liber secretorum, "Rogasti me, amice, ut describerem."

Brussels, Library of the Dukes of Burgundy 8488, first third of the 12th century (which would be too early for even Gerard of Cremona), Galieni secretorum, "Rogasti me amice."

Berlin 166 (Phillips 1672), 14th century, fols. 26-34. The following description is found in the margin, upper left hand corner: "Secreta G. a magistro Girardo cremonensi translata de arabico in latinum. Verba G. Incipiunt secreta G."

Berlin 908, 15th century, fol. 279-, "Incipiunt Secreta Galieni a magistro Gerhardo Cremonensi translata de Arabico in Latinum in Toleto . . . / . . . Expliciunt gloriosissima secreta galieni."

Vienna 2296, 13th century, fols. 116r-122r, Pseudo-Galenus, Liber secretorum ad Monteum.

Vienna 2395, 13th century, fols. 65r-72r, "Hec sunt secreta Galeni a Gerardo Cremonensi translata de arabico in latinum."

Vienna 2306, 14th century, fol. 27v, Pseudo-Galenus, Liber in medicatione aegritudinum ad Monteum, "Rogasti me amice montee."

Wolfenbüttel 1014, 15th century, fols. 72v-73v, Secreta Galieni. Preceded by *Experimenta magistri Bernhardi,* which is presumably the *Experimentarius* of Bernard Silvester, and followed by fols. 74-77, Experimenta varia magistri . . . (name erased), and fols. 79-81, Experimenta ex libris medicinalibus diversis. In the same MS at fol. 102, De libro Kyranidis Kyrani, regis Persarum.

Wolfenbüttel 2156, *anno* 1452, fols. 178-9, Quatordecim experimenta de secretis Galeni ad amicum quendam. At fols. 427-35 are the *Medical Experiments* of Rasis.

Wolfenbüttel 2841, *anno* 1432, fols. 98v-107v, Liber secretorum Galieni translatus ex Arabico in Latinum a magistro Gerardino Cremonensi.

Escorial H-III-2, 15th century, fols. 9-25, "Hec sunt secreta galieni. Verba galieni. Rogasti me amice montee ut describerem tibi librum . . . / . . . Quod si ceciderit alius liber ab isto transferam ipsum. Explicit liber secretorum Galieni.

The brief descriptions in the MSS catalogues do not always make clear whether the *Secrets* of Galen in question is our treatise or not.

Bourges 299, 14th century, fols. 97v-105, "Liber de secretis secretorum Gal." is probably our treatise. This MS contains minor medical works of Galen.

Vienna 5435, 15th century, fols. 265-75, Pseudo-Galenus, Liber secretorum; followed at fols. 276-83, by Pseudo-Galenus, Liber experimentorum et secretorum. Probably our treatise and the *Medical Experiments.*

Vienna 5504, *anno* 1464, fols. 147-8, Liber de secretis secretorum Galeni secundum sententiam Hippocratis; fols. 149-62, Galenus, De secretis secretorum.

BN 7031, 15th century, fols. 1-17v, "Incipiunt secreta Galieni canones quos misit ad moteum Regem assiriorum" (Secrets of Galen, or Canons which he sent to Moteus, king of the Assyrians), turns out upon examination to be an entirely different treatise.

CHAPTER LXV

EXPERIMENTS AND SECRETS OF GALEN, RASIS, AND OTHERS
II. CHEMICAL AND MAGICAL

The *Liber Vaccae*—Its other titles—Its two prologues—Experiments in magic generation and rain-making—More magic with animals—Other marvelous experiments—Plato as an alchemist—Galen as an alchemist—*Eighty-eight Natural Experiments* of Rasis—*Liber ignium* of Marcus Grecus—Further experiments—*Secretum philosophorum*—Experiments connected with writing—Riddles: a trick with a knife—Deceiving the senses—Tricks of jugglers—Mathematical problems—Astronomy: experiments with air: the magnet—*Le Secret aux Philosophes*—*Natural Experiments of Solomon*—Experiments without author or title—Twelve experiments with snakeskin of John Paulinus—Marvelous virtues of snakeskin—Other treatises concerning the virtues of snakes—Chemical experiments of Nicholas—Books of waters—Colors—Necromantic experiments—*Experimentum in dubiis*—*A natural experiment*—Variety of experiments in medieval manuscripts—An experimental manuscript—Experimental character of the Sloane MSS—Some seventeenth century experiments—More recipes and experiments—Magic experiments—Appendix I. Manuscripts of the *Liber Vaccae*—Appendix II. Manuscripts of the *Secretum Philosophorum.*

The *Liber Vaccae.*

Of the books of experiments of a chemical or magical character which we have to consider in this chapter the earliest, as far as our available information goes, is the *Liber Vaccae,* with which the name of Galen is associated and which is primarily a collection of magical and necromantic experiments. The original author, however, was the philosopher Plato whose work, according to a long, rambling, and confused prefatory statement, Galen had revised and abbreviated. Steinschneider held that our treatise was cited under the title *Liber de prophetiis* by Pedro Alfonso in the *Disciplina clericalis* at the close of the eleventh century,[1] but perhaps Pedro knew it in Arabic or Hebrew [1] rather than Latin translation. The manuscripts of the Latin translation, however, go back to the thirteenth, if not to the twelfth century,[2] while for most of the other treatises to be considered in this chapter the oldest extant manuscripts seem to be of the fourteenth century. Moreover, William of Auvergne refers to our treatise in his work written in the first half of the thirteenth century.

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[1] Steinschneider (1906), p. 44; (1862), p. 53.

Its other titles.

The work has many other alternative titles besides *Liber Vaccae,* which seems to be suggested by its first experiment which is concerned with a cow, and *Liber de prophetiis,* which I do not remember to have seen in any Latin manuscript. Another common title is *Liber Anguemis* or *Anequems* or *Anegnems* or *Anagnenis,*[3] although the preface explains that the treatise was not called the *Liber Anguemis* in the first place. The manuscripts also call it *The Book of Active Institutes* and *The Book of Aggregations of Divers Philosophers.* William of Auvergne spoke with disapproval of our treatise as a book of mixtures employed in magic, which was ascribed to Plato and called *Liber Neumich* or *Nevemich,* or the *Laws* of Plato. "And," adds William sarcastically, "it is called the *Laws* of Plato because it is contrary to the laws of nature." [4] Steinschneider has pointed out that in Arabic *Nawamis* means "laws" and that both *Neumich* and *Anguemis* are probably Latin corruptions of the Arabic word. And of course *Laws* and *Institutes* are practically the same thing. Pico della Mirandola, writing against astrology at the close of the fifteenth century, refers to our treatise by the two titles *De vacca* and *Institutes,* warning his readers that astrologers palm off their volumes as the writings of great authorities like Aristotle, "just as magicians carry about the books of Plato *De vacca* and what they call the *Books of Institutes,* stuffed with execrable dreams and figments." [1]

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[1] A Hebrew version is extant in a Munich MS (214, fol. 109v) described by Steinschneider (1862), pp. 54-5.

[2] For a list of the MSS see Appendix I to this chapter.

[3] A *Liber tegimenti* cited in the *De mirabilibus mundi* ascribed to Albertus Magnus perhaps refers to our treatise, of which the *De mirabilibus* seems to make further use. The citation from the *Liber tegimenti* is to the effect that a training in dialectic, natural science, astrology, and nigromancy is necessary for one who would thoroughly understand the world of nature and the books of the philosophers.

[4] Cited by Steinschneider (1862), pp. 52-3, "Liber Neumich, sive nevemich, et alio nomine vocant leges Platonis, qui totus liber est de huiusmodi commixtionibus; et vocatur leges Platonis, quia contra leges naturae est." The passage was first noted by A. Jourdain.

Its two prologues.

Honein ben Ishak again appears in connection with a supposititious work of Galen. The long and repetitious prefatory statement, to which we have already alluded, is professedly by him, and we are told what Honein said and what Galen said and what Honein says Galen said in great profusion. The Latin translator, however, not to mention subsequent copyists, has perhaps taken liberties with the wording of this preface and corrupted an original Arabic clarity. Who the Latin translator is we are not told, but in some manuscripts the prefatory statement to which we have thus far alluded is proceeded by an even longer prologue which opens with the pious wish, "May God confer noble morals upon you." This is probably the same as a prologue by "Farachius" opening, "Friend, may God grant you noble morals," which Steinschneider held belonged with the *Medical experiments* of Galen or Rasis.[2] But our prologue seems to contain a direct allusion to the following *Liber vaccae* [3] as well as to be generally appropriate to it. The name of the writer of this first prologue is not given in the manuscripts I have seen, but he refers to his books concerning animals and poisons and simple medicines, which last is also called the *Book of Sustenance (liber sustentationis).* He appears to have been criticized for his propensity toward marvels and occult virtues and his inconsistency in at the same time censuring vulgar suspensions, incantations, and cures. His defense of occult properties is the usual one that even if reason cannot account for them, they are supported both by the testimony of the ancients and by experience. As usual the property of the magnet is adduced; the Pseudo-Aristotle is cited "in his books on stones," and the genuine Aristotle in the *History of Animals* concerning the narce's power of stupefying. The remainder of the prologue consists chiefly of a series of citations from various authors which are largely duplicated in the *De mirabilibus mundi* ascribed to Albertus Magnus. This first prologue cannot be by Honein, since it cites not only Costa ben Luca but *filius messie,* that is, Yuhanna ibn Masawaih who died at Cairo in 1015, or some Latin writer of the eleventh or twelfth century who pretended to translate his works from the Arabic. Presumably therefore it is by the Latin translator of the *Liber vaccae.* This could not be Faradj ben Salem under Charles of Anjou if the translation was known to William of Auvergne early in the thirteenth century.

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[1] *Adversus astrologes,* lib. I, "sicut libros Platonis de vacca magi circumferunt et quos vocant institutionum execrabilibus somniis figmentisque refertos."

[2] See above, p. 756, note 3.

[3] Digby 71, fol. 37r, "quare negas ergo quod si vacca sit reliquarum rerum que suis proprietatibus agunt (?) donec experiaris et certificis certitudine."

Experiments in magic generation and rain-making.

The experiments of the *Liber vaccae* are hardly such as can be described in detail in English translation. Some of them are elaborate experiments in unseemly generation and obstetrics, having for their object "to make a rational animal" from a cow or ape or other beast,[1] or "to make bees." [2] By a similar procedure a liniment is obtained which has such virtue that if one is anointed with it, one feels no pain from blows, while it blunts the edge of a sword with which one is struck. Or by suffumigations with it rain may be produced.[3] A less unmentionable method of rain-making is that which is "famous among the wise" and which, the author says, some employ in his own time. First a black crow without a speck upon it is to be "submerged in water until it dies." Then a very black dog is to be imprisoned in a dark house and given the crow to eat and the water in which it was drowned to drink on the third day. By the eleventh day, we are assured, only the whites of his eyes will show and he will be unable to bark. Then one takes a small tree called *mephus* with small leaves like rue and a flower like the bean, and gives the dog about an ounce of its juice, which will cause him to recover his voice and bark mightily. He should then be bound "hand and foot" (*manus et pedes*) and boiled in a big pot. The broth thus obtained is to be used to bring rain.[1] Other procedures are described to stop a rainy spell and restore fine weather.[2]

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[1] Arundel 382, fols. 47v-48r; Digby 71, fol. 42v; Corpus Christi 125, fol. 147r-v.

[2] The Hebrew version, according to Steinschneider (1862), p. 54, devotes its first chapter to making bees from a calf and a calf from bees rather than, like the Latin version, to the production of "a rational animal."

[3] Arundel 342, fol. 48v; Digby 71, fol. 43v; Corpus Christi 125, fol. 148r.

More magic with animals

In order to see spirits a white cock with a round crest which is concave in the middle is put in a place where neither the bark of a dog nor the voice of a crow is heard, whereby this experiment is sharply distinguished from the dog-and-crow procedure. For three successive days the cock is to be fed on the eyes of three fish of the species known as *alliataiu,* and the eyes must have been removed while the fish were living. On the third day the cock will swell up and become aggressive and his crest will grow inflamed. After three hours he is to be decapitated and fed to a wild cat, which is then to be beheaded in its turn. Its blood and gall are to be dried and from them a concoction is to be prepared which will enable one to see spirits.[3] A frog figures as an ingredient in a mixture which, if one merely writes with it on parchment and throws the same into a den of snakes or vipers, will excoriate and kill them instantly.[4] The congealed blood of an ass is a constituent of a suffumigation which enables one to learn what the future holds in store of good or evil.[5] Indeed throughout the work parts of animals are the favorite substances employed, although stones and herbs are also used.

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[1] Corpus Christi 125, fol. 150r.

[2] *Ibid.,* fol. 150r-v. As the three MSS which I used were all difficult to decipher, I did not take time to locate each recipe in all three, having satisfied myself of the essential identity of contents of the two Oxford MSS at least, which I compared together.

[3] Arundel 342, fols. 50v-51r.

[4] *Ibid.,* fol. 54v; Digby 71, fol. 56r; Corpus Christi 125, fol. 159v.

[5] Arundel 342, fols. 52v-53r.

Other marvelous experiments.

The *Liber Vaccae* abounds in suffumigations, marvelous houses, golden or otherwise, and magic lamps and fires. One makes men appear in any form desired;[1] another makes a house seem to be full of snakes;[2] or a lamp is extinguished by opening the hands over it and is relighted by closing them.[3] Such marvels we shall find frequently repeated in our following books of experiments. That of holding fire in the hand and not being burnt by it is here described as if quick-lime were used rather than alcohol.[4] Other paragraphs tell how to plant seed and have it grow instantly,[5] how to understand the language of the birds,[6] how to answer questions about persons who are absent,[7] how to sit under a tree and cause it to incline toward you.[8] The last recipe calls for the teeth, nose, and bones of a dead man. But perhaps we have sufficiently illustrated the character of the *Liber Vaccae*. Its necromancy should have at least "provoked the silent dust" of Plato and of Galen.

Plato as an alchemist.

To Plato and Galen, though never apparently again in partnership, were also attributed various works of alchemy in the middle ages. Most widespread would seem to have been *The Fourth Book* or *Four Books*, which is found both in the manuscripts and in print. In an Oxford manuscript[9] it opens by Thebit, presumably ben Corat, asking Hasam to

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[1] Arundel 342, fol. 53r.

[2] Corpus Christi 125, fol. 159v.

[3] Digby 71, fol. 56r.

[4] Arundel 342, fol. 54v; Corpus Christi 125, fol. 159v.

[5] Corpus Christi 125, fol. 157r.

[6] *Ibid.*, fol. 151v.

[7] *Ibid.*, fol. 152r.

[8] *Ibid.*, fol. 151v.

[9] Digby 219, late 16th century, fols. 120-43, "Liber quartus Platonis tribus partibus, explicatus ab Hamete filio Hasam rogatu Thebeth," opening "Dixit Thebeth Hames filio Hasam, Abrevia nobis quod de revelatione occultorum intellexisti et expone librum senioris Platonis," and closing, "Dixit Plato et qui cognovit cognovit quod quedam dictorum nostrorum, etc. Hic defiunt multa."

Other earlier MSS are:

S. Marco XVI, 1, 14th century, fols. 43-6, Platonis quartus super secretis naturae, opening, "Dixit Plato, cum res ex eodem genere sint. . . ."

S. Marco XVI, 3, 15th century, fols. 291-303, Commentum tertiae partis quarti de quartis Platonis, opening, "Haec scientia incipit a potentia et pervenit ad actum. . . ."

Bologna University Library 138, 15th century, fols. 216v-21v, "Quartum Platonis scolasticorum. Dixit Plato . . . / . . . omnibus diebus vite sue."

Bologna University Library 270, X, 15-16th century, fol. 185r, "Quartum Platonis scolasticorum. In nomine Dei . . . / . . . intellige hoc."

"tell us briefly what you have learned of the revelation of things occult and expound the book of old Plato." Thebit also introduces both of the other parts of the book in this manuscript, but for the most part Hames tells us what Plato said. This indirect form of presentation is somewhat similar to that of the *Liber Vaccae,* and there is also much talk of abbreviating even in the fuller and different printed version,[1] which is divided into four books, but the contents are entirely alchemical and there is no mention of Galen. The work seems to be a translation from the Arabic and not a Latin forgery. Berthelot placed the Latin translation of the alchemical treatise of the Pseudo-Plato about 1200.[2] But there are in the manuscripts yet other works of alchemy ascribed to Plato, one of which, *The Thirteen Keys of Greater Wisdom,* is said to have been translated from Arabic into Latin about 1301 A. D.[3]

Galen as an alchemist.

As for Galen, a *Commentary of Galen upon Hermes' Book of Secrets*[4] turns out to be an alchemy of the incoherent and mystical variety. A *Practice in the Secrets of Secrets of Nature* ascribed to him is obviously spurious, since it opens by citing Geber. It is accompanied by a *Theorica.*[5] Indeed, the *Practica* is really the same as the treatise usually ascribed to Archelaus.[6] There was perhaps a medieval alchemist named Galen, since a manuscript at Paris states that "Master Galienus the writer who is used in the episcopate is an alchemist and knows how to whiten *eramen* so that it is as white as ordinary silver.[1]

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[1] Zetzner, *Theatrum Chemicum,* V (Strasburg, 1622), 114-208, "cum commento Hebuhabes et Hamed philosophorum, explicatus ab Hestole." Concerning the Arabic original see Steinschneider (1906), p. 44. Berthelot (1893) I, 247-8, spoke of it as "ouvrage juif."

[2] Berthelot (1893) II, 398. Lippmann (1919), p. 480.

[3] S. Marco XVI, 1, 14th century, fols. 20-26, Incipit liber Platonis de tredecim clavibus sapientiae maioris, translatus de arabico in latinum anno. Dom. 1301. It opens, "Narraverunt quod in terra Romanorum fuit quidam philosophus qui vocabatur in arabico Platon. . . ."

Examples of MSS of what seem to be still other Platonic alchemies are:

Orléans 290, 16th century, fol. 207-, "Incipit summa Platonis alkymie sic inquiens: Cum res ex eodem sunt. . . ."

Riccard. 119, fols. 1r-2v, "In nomine domini amen. Incipit liber Platonis super aptationem lapidis pretiosi scribens filio suo ex dictis philosophorum. In vii capitulis."

[4] Corpus Christi 125, fols. 78-80r, Galeni super Hermetis librum secretorum expositio.

[5] Riccard. 1165, 15th century, fols. 96-101, "Practica in secretis secretorum naturae," fols. 101-105, "Theorica."

[6] J. Wood Brown (1897) 83, has pointed out that in Riccard. 119, fols. 192v-195v, the *Liber*

The *Eighty-eight Natural Experiments* of Rasis.

The *Eighty-eight Natural Experiments* of Rasis [2] are not medical but a series of magic tricks and chemical experiments. Yet they are not only ascribed to Rasis, or at least are said to be a selection from a larger work of his recently translated from Arabic into Latin at Toledo,[3] but the translator seems to be the same mysterious Ferrarius [4] of the *Experimental Medicines,* while the opening words [5] are very similar to those of the *Secrets* of Galen which Gerard of Cremona is supposed to have translated, except that here we read, "You have asked me, friend Anselm" instead of

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Archelai Philosophi de arte alchimiae is called also in the margin *Practica Galieni in Secretis secretorum.*

[1] BN 6514, but Brown (1897) 83, who quotes the Latin of the passage fails to mention the folio of the MS.

[2] Both copies of this work of which I know seem to be fragmentary. Amplon. Quarto 361, English cursive hand of early 14th century, fol. 24, I have not seen, and follow the description of it by V. Rose in his "Ptolemaeus und die Schule von Toledo," *Hermes,* VIII, 338-40, which is fuller than the notice in Schum. Rose knew of no other MS of the treatise, but I have examined it in the following: Digby 67, 15th century, fol. 32.

Both MSS have the same prologue by Ferrarius, in which the number of experiments is stated as eighty-eight, and both open with the same experiment. Rose gives the headings of only fourteen others, and then begins the Book of Fires of Marcus Grecus, "Nunc incipiet liber ignium a marcho greco descriptus," which, as Rose says, follows the same form of a series of experiments as the preceding Rasis. Indeed, in Digby 67 the experiments of both treatises are numbered continuously in the margin. The Rasis seems to end with the experiment numbered 33, a circumstance which led Macray to describe it as containing 33 instead of 88 experiments. Digby 67, however, does not at present contain experiments 1-33 inclusive, but only 1-5 and 27-33; apparently a sheet is missing. The *Liber ignium,* beginning at experiment 34 and at the same juncture as in the Amplon. MS, since the preceding experiments in both cases were concerned with alcohol (*aqua ardens*), turpentine, and Greek fire, comprises twenty-five experiments, after which miscellaneous experiments carry the total number recorded in the margin up to one hundred and forty-four. In the Amplon. MS the *Liber ignium* is followed by another experimental treatise entitled *Secreta philosophorum,* of which more will be said presently.

[3] "In Toleno" or "In Coleno."

[4] "Suus suo amicus amico Anselmo ferarius."

[5] Strictly speaking there are two other sentences before the words, "Rogasti me, amice Anselme. . . ."

Monteus.[1] Only fragments of the treatise seem to be extant but enough of the eighty-eight experiments are preserved to illustrate their character. Serpents are assembled at a given spot by placing a snake in a perforated pot about which a slow fire is built in order to make him hiss and attract his kind. Fish are made to congregate similarly beneath the surface of a river by letting down into the water at night a lighted lantern with glass windows in its four sides.[2] The property of alcohol (*aqua ardens*) of burning on the tip of a finger or from a cloth which has been dipped in it without consuming the cloth or burning the finger is termed magical. To cook an egg in cold water, it is placed in quicklime in a vessel, then cold water is poured in and the vessel tightly closed. Other experiments are to make a ring hop about the house like a locust, to carry live coals without injury, to light a candle from the rays of the sun, to blacken the face completely. More useful seem those experiments which consist in making alcohol, turpentine, or Greek fire.

Liber ignium of Marcus Grecus.

Following the three experiments just mentioned, in both the manuscripts of the *Eighty-eight Natural Experiments* which we have just been describing, comes *The Book of Fires for Burning Enemies* of Marcus Grecus.[3] Since it is also found in other manuscripts,[1] it would appear to be a distinct treatise from the *Eighty-eight Natural Experiments,* although its form is similar. Berthelot already has been impressed by the close association in this treatise of "purely scientific compounds of combustible or phosphorescent substances and the preparations of prestidigitateurs and magicians." [2] For instance, in an effort to make an inextinguishable fire glow-worms are pulverized and mixed with other substances and then warmed for a certain number of days in horse manure.[3] A lamp that will shed a silvery light on everything in the house is obtained by smearing the wick with a liquid similar to quicksilver supposed to be obtained by cutting off a lizard's tail.[4] Or everything around will appear green, if the brain of a bird is wrapped in cloth and burned with olive oil on a green stone. If the hands are rubbed with an Indian nut or chestnut and "water of camphor," a candle may be extinguished by opening them above it and relighted by closing the hands.[5] Other ointments are said to keep one from being burned by a flame or by the red-hot iron in the ordeal.[6] More scientific are the recipes for oil of sulphur, gunpowder, Greek fire, alcohol.[7] Two of the more fantastic experiments are said to have been discovered by Aristotle for Alexander,[8] and another cites Hermes and Ptolemy for its "prodigious and marvelous works." [9] The reader will have noticed the recurrence of some of the matters treated in the *Natural Experiments* of Rasis. Such repetitions and resemblances are common in the medieval collections of recipes and experiments.

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[1] Professor D. B. Macdonald warns me, however, that these are common opening words in Arabic treatises.

[2] This and the preceding experiment follow the *liber ignium* of Marcus Grecus in CLM 197, 1438 A. D.; see Berthelot (1893) I, 124.

[3] First printed in 1804 by La Porte du Theil at the wish of Napoleon who had heard of the old recipes for Greek fire. Hoefer gave a faulty edition of it in his *History of Chemistry*, 2nd edition, I, 517-24. I have employed the text printed by Berthelot (1893) I, 89-135, from four continental MSS: BN 7156, 13-14th century; BN 7158, 15th century; CLM 267, about 1300 A. D.; CLM 197, about 1438 A. D. This text is accompanied by a French translation, introduction, and notes. Berthelot's discussion of Marcus Grecus suffers from his ignorance of the existence of other collections of experiments similar to it in MSS contemporary with it. He notes only its resemblance to the *De mirabilibus mundi* ascribed to Albertus Magnus and to the books of secrets printed in the sixteenth century. Marcus Grecus seems not the same as Mark, the canon of Toledo (Marcus Canonicus Toletanus) in the twelfth century who translated into Latin the Koran and works of Hippocrates, Galen, and Honein ben Ishak: see Steinschneider (1905), p. 54.

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[1] Besides the MSS used in his text Berthelot alludes to some MS of the *Liber ignium* in England which belonged to a Mr. Richard Mead (probably, Professor D. B. Macdonald suggests, Dr. Richard Mead, the eighteenth century London physician, many of whose books are now in the Hunterian Museum, Glasgow), but does not mention Digby 67 and Amplon. Quarto 361, which we have described already; nor CU St. John's 177, 14th century (Italian), fol. 15v, "Incipit liber ignium a marco greco prescriptus"; nor Sloane 323, 14th century. fols. 162-5; nor Digby 153, 14th century, fol. 179v-, where it is reduced to ten experiments. There may be other MSS of the *Liber ignium* in the British Museum, as I have not searched especially for them. In Arundel 164, 15th century, fol. 192v, are Recepta varia de praeparatione ignis graeci.

[2] Berthelot (1893) I, 131.

[3] *Ibid.*, pp. 111, 120.

[4] *Ibid.*, p. 114.

[5] *Ibid.* p. 115.

[6] *Ibid.*, pp. 114-5.

[7] *Ibid.*, pp. 117-8.

[8] *Ibid.*, pp. 105-7.

[9] *Ibid.*, p. 112.

Further experiments.

At the close of the *Book of Fires* of Marcus Grecus, in one of the two manuscripts [1] where it follows the *Eighty-eight Natural Experiments* of Rasis, the listing of experiments of the same sort continues without any new title and the consecutive numbering of them in the margin goes on up to one hundred and forty-four in all. It is doubtful, however, how far we may regard these additional experiments as a resumption of the text of Rasis, which had been interrupted by the work of Marcus Grecus, since we cannot arrive at an even number of eighty-eight experiments by any combination. These additional experiments instruct us how to paint an image on the wall from which a candle may be lighted, how to write letters that cannot be read unless the material upon which they are written is placed near a fire or touched with a rod, how to make cooked meat seem raw and wormy.[2] This trick, which is found frequently in medieval manuscripts, is performed by making mince meat of the heart or dried blood of some animal and strewing the particles upon the piece of cooked flesh, whose heat will make them move like worms, while their color is that of raw meat. We are also instructed how to cook meat of a sudden, how to turn a red rose white—apparently by fumigating it with sulphur, and how to make "marvelous bottles" (*ad faciendum ampullas mirabiles*)—the directions seem to tell how to blow soap bubbles.[3] How to emit fire from the mouth, to heat a bath, to construct an artificial mill in a camp, and to make all the bystanders appear headless.[4] A score of experiments are concerned with colors and dyes.[5] To make a dog follow you, place a piece of bread and butter under your armpit, "that it may receive the odor of the sweat," and then feed it to the dog.[6] A magical experiment to deprive a man of his urine consists in taking urine and earth on which someone has made water and enclosing them together in the skin of a camel's womb or a dog's paw; "and he will have no urine as long as the earth is enclosed in the skin." [1] The last experiment, "that a wife may live a good life with her husband," involves writing an incantation upon parchment.[2]

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[1] Digby 67.

[2] *Ibid.*, Experiments 60, 71-72, 73-74.

[3] *Ibid.*, Experiments 76, 77, 88.

[4] *Ibid.*, Experiments 92, 95, 97, 127.

[5] *Ibid.*, Experiments 104 *et seq.*

[6] *Ibid.*, Experiment 136.

The *Secretum Philosophorum.*

Found together with the *Eighty-eight Natural Experiments* of Rasis in one of the two manuscripts [3] containing that work, and in other manuscripts together with the *Liber ignium* [4] and *Liber Vaccae* [5] and *Experiments* or *Secrets* of Albert,[6] is an anonymous work entitled *The Secret of the Philosophers.* As it seems to be found especially in English libraries,[7] and mainly in manuscripts of the fourteenth century,[8] it was perhaps composed in England in the thirteenth century. At any rate it claims no connection with Galen or Rasis. It is longer than most medieval collections of experiments and subdivides into seven sections, each named after one of the liberal arts.

Experiments connected with writing.

Under the heading "Grammar" materials and instruments used in writing are first spoken of, then methods of writing, especially those employed by the wise to conceal their meaning, as when the alchemists use the names of planets to denote the seven chief metals. Instructions are given for making colors employed in illuminating, ink, white tablets, and glues. We are told again how to write letters which are invisible until touched with a rod or exposed to fire. Also how to write so that the writing can be read only in a mirror, how to erase writing without leaving any mark, how to engrave steel and other metals, and how to color the letters so engraved. A paragraph on the right way of speaking might seem to belong under the head of rhetoric rather than of grammar, but just precedes the section of rhetoric in such manuscripts as I have examined. It warns against much speaking, citing Aristotle's advice to Alexander in the *Secret of Secrets,* and ends with the familiar couplet:

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[1] Digby 67, Experiment 90.
[2] *Ibid.*, Experiment 144.
[3] Amplon. Quarto 361.
[4] Also Digby 153.
[5] Digby 71 and Corpus Christi 132.
[6] Addit. 32622, Egerton 2852, Digby 37, 153, CU Trinity 1351.
[7] Of the two MSS at Erfurt one is in an English hand.
[8] See Appendix II to this chapter for a list of the MSS.

"If you would be wise, observe my five commands,
What you say, where, of whom, to whom, and when."[1]

Riddles: a trick with a knife.

The section on "Rhetoric," which is defined as speaking ornately, is devoted to riddles, verbal deceits, quibbles, and catches. Under one of its sub-heads, Of Weights, we are told how to balance a knife, although its center is to project beyond the edge of a table and although a weight is to be hung on this projecting end. "The way to fulfill the doctrine of this thing is to fix the blade of the knife in the end of a rod so that it makes an acute angle with the rod, and you will see how the rod will hang with the knife."

Deceiving the senses.

"Dialectic" is concerned in our treatise not with logical fallacies but with deception of the senses by various tricks. To make water look and taste like wine, a bottle half full of water should be held or left inverted for a time over the orifice of a jar of wine. This procedure is recommended in cases where a patient wants to drink wine and the doctor knows that it would not be good for him. In order to determine whether a patient is really dead and to prevent cases of burial alive, it is recommended to hold a mirror to his nostrils and see if it will be clouded by a faint breath. This comes under the sub-head, *De olfactus deceptione,* breathing as well as the sense of smell evidently being included under the olfactory organs. The sense of hearing is deceived by an echo, and the sense of sight by mirrors which enlarge or multiply objects or make an image appear outside the mirror. The use of burning glasses is also discussed.

Tricks of jugglers.

Under the sub-head, "Sophistries called sleight-of-hand," (*De sophisticationibus que vocantur iugulationes*), come the tricks or *cautelae* of the jugglers. An apple is made to move on a table by preparing a hole in the center beforehand and placing a beetle inside. To construct a cross that will seem to turn to right or left automatically in answer to questions put to it concerning hidden or future matters, one builds it up of wax about the tail of some insect or tiny animal[1] which is also concealed in wax and irritated with sage[2] so that it wiggles its tail and the cross. Hands that have been bound may be freed by cutting the rope against a prearranged knife. Again we meet the experiments to make cooked meat seem raw or full of worms and directions for blowing soap-bubbles, a process which is spoken of as "making a golden sphere appear flying in the air." Other illusions under "Dialectic" are to seem on fire and not be burned, to see stars in the daytime by multiplying the reflections of the sun, to make a silver coin seem copper, and to deceive the sense of touch by such methods as holding an object between two crossed fingers.

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[1] "Si sapiens fore vis, sex(?) serva que tibi mando:
Quid dices, et ubi, de quo, cum quo, quando."

Mathematical problems.

The headings, Arithmetic, Music, and Geometry, are more exactly appropriate to their contents than Dialectic was. One problem in arithmetic is to tell how many knights, esquires, and pages will be required to divide twenty loaves of bread, if each knight receives two loaves, if two pages share a loaf, and if four esquires share a loaf. Under geometry are calculated surfaces, the cubic contents of various receptacles, and the altitudes of inaccessible objects.

Astronomy: experiments with air: the magnet.

Under "Astronomy" the rule of superiors over inferiors is affirmed and the various attributes, properties, and effects of the planets are listed. Then come "experiments with air" and many figures of vessels partly filled with water or other liquids. Siphoning is explained under the heading, "Of the ascent of water on account of the consumption of the air lest a vacuum be left." By employing the same principle that Adelard of Bath observed in the magic water-jar of the enchantress, any one of four different liquids that the spectators choose can be poured from a single faucet. Inside the jar are four compartments each with its own air-hole above and outlet below, and beneath all four a common chamber into which they open and from which the common faucet pours. The four air-holes are covered with the fingers, and as one of these is raised, the liquid will flow from the corresponding compartment. This is illustrated by a diagram of the contrivance. The magnet is discussed under "Astronomy" "because it bears in itself a likeness of the sky." This discussion of the magnet and some of the accompanying figures resemble the treatise of Peter Peregrinus on the magnet, which was written in the thirteenth century.[1] Here the work ends in two of the three manuscripts which I have used,[2] but in the third further experiments are added.[3] Some of these have occurred before in the *Secretum philosophorum* itself, or in other experimental treatises of which we have already spoken. Others are to make fireworks,[4] to soften steel, to drive away crows, and to tell whether a person is a leper.

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[1] Called *anena* (?).

[2] *Safina* (salvia?).

Le Secret aux philosophes.

Not to be confused with the Latin *Secretum philosophorum,* which we have just described and which seems to be of English origin, is a work in the French vernacular written at the end of the thirteenth century and entitled *Le Secret aux philosophes.*[5] It is not a collection of experiments but rather an encyclopedic discussion of theological and metaphysical as well as natural problems in the form of a dialogue, presumably imaginary, although sometimes represented as a translation, between Placides, the promising son of a petty king, and his master Timeo, who chose him as his pupil in preference to the stupid son of a great emperor. Through this medium is retailed for less learned perusal much of the knowledge and superstition, especially astrological, to be found in the Latin and Arabic learning of the time. Perhaps the resemblance is greater to the *Secret of Secrets* of the Pseudo-Aristotle than to any other treatise that we have considered. The author, very weak and meager on theological and metaphysical matters, shows a much greater interest in natural science and something of the spirit of experimental research. Yet in a prologue "the compiler" gives his name as Jehan de Bonnet, priest, doctor of theology, and native of Paris. Ernest Renan was impressed by the curiosity shown concerning problems of natural science, by the "search after realities" and by the experimental spirit of the book. The solutions, as in the *Natural Questions* of Adelard of Bath, often make one smile, but "this naïve composition . . . is superior to many scholastic treatises in Latin which deal purely with abstractions and where modern thought has not its true antecedents." In this treatise, on the other hand, "the science of reality has taken the upper hand" and "the idea of research is born." [1] But Renan was mistaken in thinking such scientific curiosity a new thing as late as the close of the thirteenth century, and perhaps on that account overestimated its importance in this case.

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[1] Concerning Peter Peregrinus see S. P. Thompson, *Petrus Peregrinus de Maricourt and his Epistola de Magnete,* 1907, and *The Epistle of P. Peregrinus concerning the Magnet,* done into English by S. P. Thompson, 1902. Thompson lists eleven editions and 28 MSS. Addit. 32622, fols. 71-77r, and Egerton 2852, which I have examined, are briefer than the printed text of the *Epistola.* Addit. 32622 has the better diagrams of these two MSS.

[2] Digby 37 and 153.

[3] Addit. 32622, fols. 77-84.

[4] *Ibid.,* fol. 80v, *ad faciendum volantem* seems to be a rocket, and fol. 81r *ad faciendum tonitruum magnum et horribile* to be some sort of an explosive.

[5] The work is described in HL 30: 567-95. I have not seen the treatise itself. It exists in two different manuscript versions and a third repeatedly printed text for which no corresponding manuscript can be found.

Natural Experiments of Solomon.

Returning to books of experiments, we may note a treatise whose contents are very similar to the *Eighty-eight Natural Experiments* of Rasis, the *Book of Fires* of Marcus Grecus, and the *Secretum philosophorum,* namely, *Some experiments which King Solomon composed because of his love for, and the imploring of, a most excellent queen, and they are experiments of nature.*[2] Instead of the experiment with the snake in the pot we now have rats in a cage, whose squealing when a fire is heated is supposed to attract other rats. Again we are told how to write invisible letters, how to make a candle burn in water,[1] how to light a candle from the mouth of an image painted upon the wall. This is done by painting the mouth with sulphur and turpentine and applying the wick of the candle to it just after the candle has been blown out and before it has quite ceased to glow. Quicklime as well as sulphur and turpentine are used in an image that will illuminate and take fire when water is poured over it. Quicksilver is placed with saltpeter and sulphur inside a ring in order that it may hop about when put near a fire.

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[1] HL 30: 576 and 593.

[2] Sloane 121, 15-16th century, fols. 90v-92r.

Experiments without title or author.

Such experiments sometimes occur without any title as well as without name of author, as in a manuscript where there are a dozen leaves filled with them between the treatise on plantations and the experiments or secrets ascribed to Albert.[2] Again we encounter the jumping ring, the cooked meat turned raw, men made to appear headless, and artificial thunder which seems produced by use of gunpowder. There is much discussion of colors and alchemy and we are told how to make *sal ammoniac* and "the best bitumen." [3] But the virtues of herbs and animals are not forgotten and many of the experiments are medical or magical. Instructions are given for making a white crow by tampering with the crow's egg, and how to make human hair grow again by the application of the ashes of a mole, burned in a new pot, mixed with honey. A cure for diarrhoea is to drink milk in which a glowing iron has been quenched. Suspending the tongue of a goose over a sleeper has the appropriate effect of causing him to reveal all his secrets, while the suspension of the head of a bat prevents his waking. The bearer of the herb *aristologia* is safe from demons whether awake or asleep. To escape from chains one should employ an incantation which contains allusions to the rescue of the apostle Peter from the sea and from prison.

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[1] The knowledge that sulphur and quicklime will burn when brought into contact with water seems, as Berthelot has pointed out, (1893) I, 95, to antedate Livy who writes (XXXIX, 13), "Matrones Baccharum habitu . . . cum ardentibus facibus decurrere ad Tiberim demissasque in aquam faces, quia vivum sulfur cum calce insit, integra flamma efferre."

[2] Arundel 251, 14th century, fols. 12-24.

[3] Possibly there is some connection with the chemical experiments of James Hutton (1726-1797), the geologist, and his discovery of a process for manufacturing *sal ammoniac* from coal-soot.

Twelve experiments with snakeskin of John Paulinus.

Frequently found in the manuscripts are twelve experiments with pulverized snakeskin which John Paulinus or John of Spain excerpted from the book in Arabic of the physician or physical scientist, Allchamus or Alchanus or Alanus or Alganus, or whatever his name may have been,[1] a book entitled *Life-Saver* (*Salus vitae*).[2] This work, as John further informs us at its beginning, he discovered when he "was in Alexandria, a city of the Egyptians." [3] Steinschneider listed this John Paulinus as a different person from the well-known twelfth century translator, John of Spain, but at least in one manuscript[1] he is called both John of Spain and John Paulinus.[2]

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[1] Steinschneider (1905), p. 51, also mentions *Alcharius* and *Alcaus*. The catalogue of MSS at Munich gives *Alchabitii;* in a Bologna MS we read *Aichauus*.

[2] Steinschneider (1905), p. 51, notes only four of the following MSS, namely, those starred:

Sloane 1754, 14th century, fol. 30, "De pelle serpentis 12 experimenta et quaedam vera." No author or translator is mentioned: the treatise immediately follows the Experiments of Nicholas of Poland.

Royal 12-D-XII, late 14th century, fol. 111v.

Arundel 251, 14th century, fol. 35v.

CU Trinity 1081, 15th century, fol. 69.

Bodleian 177 (Bernard 2072), late 14th century, fols. 29v-30r.

*Ashmole 1437, 15th century, fol. 3v, "De corio serpentis." John's prefatory statement is omitted and no author is mentioned.

*Amplon. Folio 276, early 14th century, fol. 69.

CLM 206, 15th century, fol. 38, De viribus corei serpentis pulverisati.

*CLM 444, 14th century, fol. 200.

*CLM 534, 14th century, fol. 42v.

Bologna University Library 135, 14th century, fols. 31r-32r, "Aichauus, Liber vitae. . . . Illum autem librum fecit Aichauus fysicus."

Arezzo 232, 15th century, fol. 80, "Secreta magistri Iohannis," from the fact that they follow the *Verbum abreviatum* ascribed to Roger Bacon are probably the alchemical treatise attributed to Bacon's disciple, the youth John, rather than our treatise.

Sloane 3679, 17th century, fol. 96v—, "Sequuntur quaedam Experimenta mirabilia de spolio serpentis quae Jo. Hispalensis ex Arabico transtulit in Latinum ex libro salutis vitae Alcani philosophi Arabici."

[3] "Hic incipiunt 12 experimenta naturalia de corio serpentis translata a johanne paulino ab arabico in latinum ut predictus philosophus dicit cum ego Johannes essem in alexandria civitate egipsiorum reperi . . . hoc qui salus vitae appellatur. . . ." Bodleian 177.

Marvelous virtues of snakeskin.

Another manuscript[3] presents our treatise under the amusing caption, "Twelve experiments with snakeskin and some of them true." All due credit should be given for such partial scepticism but it might well have been made more sweeping. The snakeskin is to be pulverized when the moon is in the first degree of Aries, and one manuscript adds that this must be the full moon.[4] This powder will heal a wound in the head, or will keep the head from being wounded, if it is sprinkled on the hair. A face, washed with it and water, is terrible to foes and secures the faithful allegiance of friends. If the powder is scattered in an enemy's house, he will be unable to remain there. To secure an attentive hearing in a council, sprinkle a little at your feet. Place some on the tip of the tongue, and you will be invincible in scientific disputations. "And this has been tested many times." This healing and magic powder also enables one to see into the future, to learn another's secrets, to insure the fidelity of a servant or messenger, to guard against poison, to win the love of a woman. If a leper eats some of it, his disease will grow no worse. This last experiment is perhaps suggested by Galen's story of the cure of skin disease by drinking wine in which a viper had died.

At the end of these twelve experiments one manuscript

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[1] Arundel 251, "Cum ego Johannis hyspanicus. . . ."

[2] At least he seems to have been a different person from John of St. Paul's, a medical writer whose works will be found in a number of MSS in the collections of Amplonius and Sir Hans Sloane, and whom Scott in his *Index* to the Sloane MSS has identified both with the translator of the snakeskin experiments and with John Platearius.

And still different from any of these would seem to have been "Ioannis Paulus de Fundis," doctor of arts and lecturer on medicine and astronomy in the university, and astrologer of the commune, of Bologna, whose *Tacuinus astronomico-medicus*, written in his own hand in February, 1435, is preserved in a MS of the University Library at Bologna. Nor is this *Tacuinus* to be confused with the earlier work of that title translated by the Jew Faradj ben Salem for Charles of Anjou.

[3] Sloane 1754

[4] Sloane 1754. These virtues ascribed to snakeskin are perhaps to be connected with the belief that the serpent renews its youth by changing its skin every year: see J. G. Frazer (1918) I, 66.

Other treatises concerning the virtues of snakes.

adds that "John in the same book gives additional statements which Alcanus composed," and continues with further suggestions concerning the medicinal preparation and uses of snakes and their skins and blood.[1] Similar are *Secrets concerning the Serpent,* which, according to a manuscript of the fifteenth century in the Bodleian, Albertus Magnus gave to a doctor of sacred theology of the order of Friars Minor at Nürnberg,[2] and which direct how to prepare snakes and recount their medicinal virtues. It will be recalled, too, that in our preceding chapter we treated of the *Experiments* of Nicholas of Poland which made considerable use of pulverized snakes or toads or scorpions, and which are sometimes found in the same manuscripts [3] as the *Twelve Experiments with Snakeskin.*

Chemical experiments of Nicholas.

Perhaps this is the same Nicholas to whom chemical experiments are attributed in two Oxford manuscripts.[4] In the fuller manuscript these experiments are numbered in the margin from one to twenty,[5] but sometimes more than one recipe or item is found under a number.[6] Besides some alchemistic generalizations, such as the opening sentence which states that there are seven bodies, namely, Saturn, Jupiter, Mars, Sun, Venus, Mercury, and Moon, and a recipe or two for making gold and silver, the treatise consists of instructions for the preparation of such chemicals as *sal ammoniac,* quicksilver, arsenic, sulphur, and common salt, and of other recipes similar to those in the *Book of Fires* of Marcus Grecus.[1] The author frequently cites the books and experiences of the philosophers but also speaks of his own experiments. Once, for example, he supports the assertions of the philosophers by adding, "And I, Nicholas, say that I have tested these two operations experimentally":[2] in another place he says of a powder recommended "by a very wise philosopher" that he has not yet experienced it himself as the operation is long and difficult.[3]

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[1] Royal 12-D-XII, fols. 112r-113r. Sloane 1754 ends immediately after the twelfth experiment with the powdered snakeskin, while Arundel 251 adds but one further sentence.

[2] Canon. Misc. 524, fol. 17r-v, "Secreta Alberti magni de serpente dedita uno doctori sacre theologie ordinis minorum de Norenbergia."

[3] Sloane 1754 and CLM 534. Sloane 1754 also contains the following experimental works which have not yet been mentioned: fols. 80-82, *Experimenta de sanguine;* fols. 197-201, 205-8, 212-8, 222-31, *Chimica experimenta varia.*

[4] Ashmole 1448, 15th century, pp. 119-28, de experimentis chemicis in viginti capitula distributis, opening, "Septem sunt corpora scilicet Saturnus, Jupiter," and closing, "Et sic finitur opus Nicholai."

Corpus Christi 125, 14-15th century, fols. 90r-91v. This has the same *Incipit* and some of the same experiments, but is briefer. It addresses a certain William (fol. 90r) and cites Michael Scot (fol. 91r).

Duhem, III (1915) 443, note, cites from Digby 164, which I have not seen, "Chi sont les lettres de frère Nichole envoiiées à Bernard de Verdun et les lettres de frère Bernard envoiiées à frère Nichole sur la pierre des philosophes."

[5] This marginal numbering goes on from 21 to 64 in succeeding treatises, including one on twelve waters, numbered 25 to 36.

[6] For instance, under 9. *Aqua pro igne Greco, Ignis inextinguabilis, Ignis quem invenit Aristoteles cum Alexandro, De 3 generibus igneum;* under 10, *Ad accendendum ignem ad solem, Ut manus ardere videatur nec ardeat, Ignis discurrens, Candele, Ignis ad sagittandum.*

Books of waters.

In addition to the *Book of Fires* of Marcus Grecus and the experiments with air in the *Secret of Philosophers,* we must not forget the treatises in medieval manuscripts devoted to marvelous waters, medical and chemical. We have already seen such works attributed to Aristotle[4] and to Peter of Spain.[5] At that time, of course, various liquid compounds and acids were known as "waters"; alcohol, for instance, was called *aqua ardens;* and in one manuscript some of the "waters" are really dry or solid.[6] As in the case of the treatises ascribed to Aristotle and Petrus Hispanus, twelve seems to be the favorite number in these medieval collections of waters, but the twelve are not always the same,[7] and sometimes, while the title says twelve, the text will include more than that number.[1] Such a collection of twelve waters is sometimes ascribed to Rasis,[2] and once to Vergil,[3] but often occurs anonymously.[4] Other treatises on waters in general and the fountain of youth in especial are ascribed to famous names, Albert Magnus,[5] Arnald of Villanova,[6] and Thaddeus of Florence[7] and of the University of Bologna, a thirteenth century writer upon anatomy and medicine who lived from 1223 to 1303. We also encounter

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[1] See the headings in the preceding note, and other chapters, most of which Black has already listed in his description of the MS, where he says, "Some of the chapters are curious and highly deserve notice."

[2] Ashmole 1448, p. 119.

[3] *Ibid.,* pp. 125-6.

[4] See above p. 251.

[5] See above p. 500.

[6] BN 6514, fol. 40.

[7] In the Florentine MS, Palat. 887, 15-16th century, fols. 89-, 91-, 93-4, three different books of twelve waters occur in succession; and Berthelot (1893) I, 70, has noted that the texts of the *Book of Twelve Waters* are different in MSS, BN 6514, fol. 40 and BN 7156, fol. 145v, and in the printed *Theatrum chemicum,* III, 104. Also in Ashmole 1448, 15th century, occur two different *Books of Twelve Waters,* at pp. 130-40, "Incipit liber de aquis qui dicitur 12 aquarum . . . / . . . explicit tractatus 12 aquarum;" at pp. 193-6, "Hic incipit liber 12 aquarum Alkimie seu in Alkamica."

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[1] In the first *liber de aquis* in Ashmole 1448 mentioned in the preceding note there are paragraphs numbered from 25 to 57 and more than twelve waters are mentioned.

[2] Digby 119, early 14th century, fols. 205-6, Liber Rasis de aquis 12 optimis, opening, "Aqua mollificatissima et nigrissima."

Sloane 1754, 14th century, fol. 112r, "Incipit liber rasis de 12 aquis preciosis. Libelli huius series 12 splendet capitulis. Primum de aqua rubicunda. Secundum de aqua penetrativa. Tertium de aqua mollificanti et ingrediente. Quartum de aqua eiusdem ponderis et magni nominis. Quintum de aqua ignita. Sextum de aqua sulphurea. Septimum de aqua cineris. Octavum de aqua aurea. Nonum de aqua martis de albatione. Decem de aqua almarcaside et argenti dissolutione. Undecimum de aqua in mercurii congelatione et conglutinatione. Duodecimum de aqua perpetua."

In the same MS at fol. 78r-, "Incipit 12 aquarum liber. Libelli huius series duodecim splendet capitulis. Primum de aqua rubicunda. Secundus de rubicundo ere. 3m. de rubigine. 4m. de croceo ferreo. 5m. de rubicundo lapide. 6 de aqua sulphurea. 7 de aqua cineris. 8 de gummi rubicundo. 9 de aqua penetrativa. 10 de aqua marchaside in argenti dissolutione. 11 de aqua vitrea. 12 de fermento."

As the *Incipits* and chapter headings suggest, the two treatises are in portions identical, elsewhere divergent. Such is also apt to be the case where the work occurs in different manuscripts.

[3] Vienna 5230, 15-16th century, fols. 293-5, "Primo recapitulat libellus . . . / . . . sulfuris et magnesie vocabulum assumit."

[4] Some MSS are:

Corpus Christi 125, 13-15th century, fols. 82-3. "Explicit liber duodecim aquacionum."

Corpus Christi 277, 15th century, fol. 9, Liber duodecim aquarum.

Digby 219, late 16th century, fol. 109v, "Libelli huius series 12 splendet capitulis."

Ashmole 1485, fol. 173.

CLM 405, 14-15th century, fol. 65, Liber aquarum; fol. 160, De XII aquis.

Bologna University Library 474, fols. 16r-19v, "Libelli huius series. . . ."

Savignano di Romagna 44, 15th century.

[5] Vienna 5315, 15th century, fols. 128-33, de aqua vitae, "Inter cetera domini Alberti magna aquarum experimenta . . . / . . . urina fractum expellit."

[6] CLM 666, 15th century, fol. 81-, Arnoldus de Villanova de aquis.

[7] *De virtutibus aquae vitae*, in both CLM 363, 1464-1466 A. D., fol. 78; and CLM 666, 15th century, fols. 129-47.

Nine Waters of the Philosophers,[1] *Physical Waters,*[2] and a *Book of Saint Giles concerning the virtues of certain waters which he made while dwelling in the desert.*[3] The saint would scarcely seem to have chosen the best place for the investigation of his subject. Such are a few specimens of medieval works on waters; many more might be collected.[4]

Colors.

Experiments with colors are also of rather frequent occurrence in medieval manuscripts, and seem to a large extent to be anonymous. I have not sufficiently examined them to be able to say what additions may be made in the manuscripts of the thirteenth and fourteenth centuries to the recipes already given in the *Compositiones ad tingenda, Mappe clavicula,* and works of Heraclius and Theophilus of which we have already spoken. Like the *Book of Twelve Waters,* but not so widespread, is a treatise on twelve colors and their virtues,[5] while a Virgilius appears again as the author of *Pictorial Waters for Painting on Linen and Cloth.*[6] The works on colors of Peter of St. Audemar, of John Alcerius, and of John le Bègue have been printed by Mrs. Merrifield,[7] but many brief anonymous collections of recipes concerning colors still remain in manuscript.[8]

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[1] Vienna 5336, 15th century, fol. 29, "Prima recipe ysopi pulegii . . . / . . . natura provenientes."

[2] Harleian 2258, fol. 189, de aquis physicalibus.

[3] Rawlinson C, 815, 15-16th century, fols. 25-7, "Libellus sancti Egidii de virtutibus quarundam aquarum, quas ipse in deserto commorans fecit."

[4] Such as Digby 71, 14th century, fols. 81-4, *aqua vitae;* Rawlinson D, 251, 14-15th century, fols. 64v-72, *de virtutibus aquarum;* etc.

[5] Brussels, Library of Dukes of Burgundy 14746, 15th century, Colores xii seu virtutes eorum, "Jaspis viridis et crassi. . . ."

[6] BN 7105, 15th century, #2, Virgilii de pictorialibus aquis pro depingendo super linteamina vel pannos; # 3, Anon. de coloribus.

[7] *Original Treatises dating from the XIIth to XVIIIth centuries on the arts of painting,* London, 1849, vol. I.

[8] Some of them may prove upon examination, however, to be works by known authors or extracts from the same.

BN 6552, 14th century, #2.

BN 6742, 17th century.

BN 6749, 1481 A. D. #9, 10.

BN 7344A, 14th century, #3.

BN 7400A, 14th century, #5, Modus faciendi colores et distemperandi; #6, Varia experimenta chemica.

Bernard 3623, #34, de diversitate colorum.

Digby 147, 14th century, fols. 33-4, de coloribus.

Cotton Julius D-V, end of the 13th century, fol. 156-, de viridi colore faciendo ad usum scribendi.

Julius D-VIII, fols. 77v-87, a treatise in English on colors, medicines, etc.; following it are cooking recipes and directions for

Necromantic experiments.

Other examples of necromantic experiments are found in the manuscripts than those of the *Liber sacratus, Picatrix,* and the *Liber Vaccae,* or those which are attributed to Michael Scot and Peter of Abano. An anonymous collection of "conjurations and invocations of spirits to discover thefts and other things of the sort" contains "among many other experiments" some concerning three angels in a crystal, a sibyl in a candle, four kings in a crystal, "a bearded old man," and the *ars episcopalis.*[1] A manuscript at Munich contains "A probable experiment to provoke spirits from all four quarters of the universe, whatever their condition, order, and station, by means of the mass." "A good experiment in astrology of Master John of Belton" turns out to be necromantic, consisting largely in writing and repeating such words as the Tetragrammaton.[2]

Experimentum in dubiis.

An "Experiment in cases of doubt" from an early thirteenth century manuscript at Erfurt[3] may perhaps be described more fully. It should be begun during the March equinox early in the night with psalms and prayers. Start-

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making parchment, ink, and *si vis invisibilis fieri.*

Titus D-XXIV, fol. 127, Latin and French, de distemperandis coloribus ad scribendum vel illuminandum.

Harleian 218, fol. 71, Experimenta bina Anglice: "For to rasone parchement without knyffe" and "To make asure."

Sloane 342, 13th century, fol. 132, "Quidam Lumbardus socius concessit mihi ista de libro suo qui intitulatur liber Massia de coloribus." In Egerton 840A the work of Theophilus was called *tractatus Lumbardicus.*

Sloane 1698, 14th century, fols. 45-52.

Amplon. Quarto 189, 13-14th century, fols. 67-8, Notae de coloribus.

CLM 444, 14th century, fol. 214, de coloribus faciendis.

CLM 27063, 15th century, fols. 37-8, de coloribus faciendis et remedia.

Florence II-vi-54, 13th century, fols. 1-11, "Incipit de coloribus. Simplices colorum sunt quecumque elementis consequentia. . . . / . . . Explicit de coloribus, incipit de mundo animalium."

S. Marco X-55, 14th century, fols. 1-4, "Simplices colorum sunt quicumque elementis consequantur ut igni et aeri"; apparently the same treatise as the foregoing.

Vienna 5207, 15th century, fols. 112-6, is a treatise on colors ascribed to Urso; "Primo videamus . . . / . . . et hec de coloribus summariter dicta sufficiant secundum Ursonem."

[1] Rawlinson D, 252, 15th century, fol. 98v.

[2] Sloane 314, 15th century, fol. 106v.

[3] Or at least this part of the MS is of the early 13th century. The MS, Amplon. Octavo 32, 11th-14th century, is in part a palimpsest. Our experiment, which occurs at fol. 89, has been printed in Haupt's *Zeitschrift f. d. Alterth.,* III, 190.

ing forth to a spot where potter's clay may be found, one repeats the Paternoster and Credo as one leaves his house or church. On the road he repeats seven psalms, and if he meets any passers-by, returns no answer to them. Having reached the potter's earth, he plants his heel upon it and turning successively to the East, South, and North, repeats the magic word "Syos" to each of those cardinal points. Turning to the East again, he utters a short prayer beginning, "Force eternal, innumerable power, true presence of things, I suppliantly beg your clemency." Then with a trowel with a white handle he cuts the earth about his heel, and digs up enough of it for his purpose, repeating the while a "Te Deum" and "Gloria in excelsis." Having secured the clay by this ceremony, when he wishes to settle any doubtful question, he writes the words "Yes" and "No" on two bits of parchment, encloses these in pastilles of the clay, places a dish of holy water between the two pastilles, saying, "In the name of Father, Son, and Holy Ghost" and another pious phrase. Then he puts the pastilles in the water, adjuring them by the names of Elias and Moses to show him the truth of the matter in question, and opens for his answer the first pastille which floats towards him.

"A natural experiment."

What we should regard as specimens of downright sorcery and magic are sometimes presented in the manuscripts not merely as "experiments," but as instances of purely scientific procedure. Under the title, "A natural experiment," which, however, is likewise called "ineffable," a writer in a Paris manuscript[1] describes three *Practicae* which may be used against enemies or serpents. Of these practical experiments the most interesting is the first, which the writer learned of when he was at Paris from Thomas de Pisan. This Thomas is also spoken of as of Bologna and as the physician of the French king. Evidently he is the father of the poetess, Christine de Pisan, Thomas of Bologna, who made astrological predictions and composed philters for the learned king, Charles V of France, and the duke of Burgundy, and who also wrote a letter on the philosopher's stone.[1] The object of Thomas' "experiment" was the expulsion of the English companies of mercenaries from the French kingdom. He procured earth from the center and the four quarters of France and under a selected constellation made five images of lead or tin in the form of nude men. On the forehead of each he wrote the name of the king of England or one of the captains of the companies and on the jaw and breast astrological characters and names. These images were hollow and were filled with the aforesaid earth and at the proper astrological moment were buried in the five aforesaid regions with an incantation to the effect that this was the perpetual burial and total destruction and annihilation of the said captain and king, and the permanent expulsion of him and every official or adherent of his "so long as this work shall endure by God's will, Amen." The images were buried face down with their hands behind their backs, "and within a few months all the said companies had fled from the realm." The writer states that all three of his *Practicae* are based on the first *Practica* of Thebit ben Corath, and notes that Albert the commentator has said in his *Mirror* [2] that such images are purely natural like medical recipes.

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[1] BN 7337, pp. 45-6, Experimentum naturale unicum(?) et ineffabile.

Variety of experiments in medieval manuscripts.

It is hard to tell where to make an end of describing or even of merely illustrating the many collections and isolated examples of "experiments," medical, chemical, culinary, artistic, magical, and necromantic, both of spurious and of anonymous authorship, to be found in medieval manuscripts. There are "experiments, good and best" which include such illusions as making a river appear to flow in a house; [3] there are "some experiments in which occur many words written in a mystic form with vowels omitted"; [4] there is an experiment to catch birds which begins by using the tongue of a dog;[1] there are "Sounds of trumpets and other mathematical experiments,"[2] and "A booklet of experiments for this and that," which opens with instructions how to dissolve phlegmatic humors.[3] In a single manuscript are "incantations and other experiments," "Experiments of Alexander," "experiments from Galen's book of *Dinamidia*," "general experiments," "Experiments of Rusticus" who is perhaps Rusticus Elpidus, physician to Theodoric, king of the Ostrogoths, and "Experiments of Parisius, Abbot of St. Mark's."[4] A certain group of experiments seems to be associated in some way with the emperor Frederick, presumably the Second.[5] Another group of perhaps twenty-five experiments was collected at Paris about 1331 and "approved by divers doctors of the same dear university."[6] In an Escorial manuscript are experiments of a chancellor and cardinal.[7]

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[1] HL 24:468-71. According to Christine, her father was "doctorifié à Bologna la Grasse en la science de la Médecine."

[2] That is, the *Speculum astronomiae*.

[3] Digby 86, 13th century, fols. 34, 46-8.

[4] Digby 69, about 1300 A. D., fol. 201, Experimenta quaedam in

An experimental manuscript.

A manuscript which belonged to an English family in Northamptonshire in the fifteenth century and received some additional entries in the sixteenth provides a good example

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quibus occurrunt multa verba scripta in forma occulta omissis vocabulis.

[1] Amplon. Quarto 301, first half of the 15th century, fol. 100.

[2] Canon. Misc. 521, 15-16th century, fol. 37, de tubarum sonis aliaque experimenta mathematica, partim ex Hugonis spiraminibus confecta, figuris instructa (mutilated at the beginning).

[3] Merton College 324, 15th century, fols. 229v-234, Libellus experimentorum pro diversis, opening "Ad dissolvendum flemmaticos humores."

[4] Additional 34111, 15th century (in English) fols. 70-, 77-, 114v-, 169-, 174-, 190v-.

[5] Vienna 5492, 15th century, fols. 1r-2v, Vididenus (?), "Liber septem experimentorum ad imperatorem Fridericum. Cap. 1; accipe sanguinem draconis. . . ." Palatine 794, 15-16th century, fols. i-xxxii, "In nomine domini Amen. Questi sono isperimenti tratti di più libri i quali lo 'mperadore Federigho fece scriuere, i quali sono prouati e ueri."

[6] Wolfenbüttel 2189, 15th century, fols. 174-5, Quedam experimenta Parisiis probata. Wolfenbüttel 2503, 15th century, fols. 271-82, Experimenta collecta a magistris Parisiensibus collaudata et primo de pulveribus / Explicit hoc opus laudabile collectum Parisius circa annos Domini 1331 approbatum per diversos doctores eiusdem alme universitatis.

[7] Escorial P-II-5, 14th century, fols. 69v-74, Incipiunt experimenta Cancellarii et Cardinalis. Possibly there is some connection with BN 7056, Experimenta magistri Gilberti Cancellarii Montepessulani, or with Wolfenbüttel 3489, 14-15th century, fols. 83-135v, Experimenta magistri cancellarii de Monte Pessulano.

of the scope and character of the experimental interest of those times. Omitting some brief family records, we find its main contents to be a calendar, list of eclipses, table and chart of the influences of planets and signs on the human body, treatises on flebotomy, on colors, a problem credited to Aristotle, verses on the seven liberal arts, medical recipes, a *compotus,* arithmetics, a *Sphere of Pythagoras,* the treatise of John Paul on experiments with snakeskin, Alfraganus on signs from thunder, what seem to be extracts from the *Herbarium of Apuleius* and perhaps from the treatise of Sextus Papirius Placitus on animals which so often accompanies it. This last is accompanied by a memorandum to the effect that there are many true things here and also many false ones. Charms and further recipes are followed by a treatise on the conduct of waters and siphoning and how to learn the altitude of objects, which is not unlikely to be an extract from the *Secretum philosophorum.* A treatise on the moon in the twelve signs is followed by one "on philosophy according to Aristotle with cases and experiments proving its thesis." It opens with the words, "In these things nature works in an occult fashion." Next comes a charm in English, then more recipes in Latin, the *Physiognomy* of Aristotle, a treatise of chiromancy, a *Dream Book of Daniel,* a further discussion of colors, the familiar charm to find a thief by means of a loaf of bread, and various tricks and fireworks.[1]

Experimental character of the Sloane manuscripts.

How long this experimental literature, which we have been describing for the medieval period, retained its popularity, and how large a place it had even in the esteem of celebrated scholars and scientists, may be inferred from the very prominent place which it occupies in the manuscript collection of Sir Hans Sloane, which with his books and scientific collections formed the nucleus of the present British Museum. Sir Hans Sloane, who lived for nearly a century from 1660 to 1753, won such a reputation both as a medical man and a naturalist that in 1727 he became physician to the king and succeeded Sir Isaac Newton as president of the Royal Society. Yet the manuscripts collected by this distinguished scientist contain about as much alchemy and astrology as they do medicine, while even in those of the seventeenth century experiments of every sort continue to play as great a part as ever before. Indeed the general tenor of the seventeenth century manuscripts in the collection seems rather more superstitious than in those of any previous century. This may be due to the fact that superstition is being crowded out of the printed page by that time, and finds a refuge only in private manuscripts, but I am doubtful if such was the fact. We must remember that the seventeenth century was marked by the witchcraft delusion, and even Boyle had not quite lost faith in alchemy despite his *The Sceptical Chemist.* Perhaps, however, the combined influences of the *Index Expurgatorius,* English censorship of the press, and the natural tendency or pretense of alchemy and magic to adopt secret and cryptic methods, were enough to keep a number of works or "secrets" in manuscript form. Be that as it may, it certainly seems as if the recipe notion dominated the catalogue of the Sloane manuscripts and especially so in those of the seventeenth century. I have not begun to note all the titles with the word or idea of experiment in them, but I should like to run over a considerable number of the subjects of seventeenth century manuscripts which I have jotted down, and which I think will serve to illuminate the character of the science of that time, and its relation to the preceding medieval literature in the same field.

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[1] CU Trinity 1081, 15th century and later. I follow the analysis of its contents by James, III, 54-7. CU Trinity 1109, 14th century, with 63 items (described by James, III, 84-92), is much the same, including various tracts of divination and astrology, and works on waters, fires, herbs, stones, and animals, together with the more reputable works of Sacrobosco, Jordanus, and Burley.

We may begin with "Notable experimentall receipts taken out of the booke of Hen. Rantzovius *de conservanda*

Some seventeenth century experiments.

valetudine."[1] We pass on to "Small empirical experiments" in both German and Latin,[2] and to "Doctor Collette's Experyment for the memory" and several medical receipts.[3] "A new system for an experimental college" is dated 1680.[4] In a long manuscript devoted to alchemy are found, among other items, "the experiment of some unknown," "some remarks about the magic image in a Benedictine monastery near Florence," "a marvelous experiment from a book printed in Flanders, but in my opinion a deceit," and some other "sophistical experiments."[5] To a manuscript in which are contained "Severall receipts of my mother's which she had chiefly in my Lord Berkeley's family"[6] soon succeeds another in which four out of the six treatises are respectively anatomical, chemical, medical, and philosophical experiments.[7] "An experiment with a mirror, for theft" and so forth, is explained by the catalogue as being "rather sundry charms by which experiments may be made."[8]

More recipes and experiments.

"Lady Rennelagh's choise receipts, as also some of Capt. Willis, who valued them above gold,"[9] are probably not very different from "A Booke of Receipts collected on Sundry occations, being for the moste part such as are commonly used in shopps yett nott to be found in the London Pharmacopaeia; with some other receipts of certaine Chymicall preparations most in use in Apothecaries shopps with the way of makeing them."[10] "L'arsenal des secrets," besides recipes for making potable gold and various elixirs, contains "Diverses secrets curieux" in the way of directions how to stamp or cast metals, to make colors, ink, and dyes.[11] Thus we see that industrial processes are still "mysteries."

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[1] Sloane 483, fols. 148-59; this and all the succeeding MSS, unless otherwise stated, are of the 17th century.

[2] Sloane 733, fols. 1-10, "Parva experimenta empirica."

[3] Sloane 744, 16th century, fols. 27-31.

[4] Sloane 1220, fols. 187-265, Novum systhema collegii experimentalis.

[5] Sloane 1255, fols. 36-38, 144v, 240, 241v.

[6] Sloane 1289, fols. 80-95.

[7] Sloane 1292.

[8] Sloane 1317.

[9] Sloane 1367.

[10] Sloane 1501.

[11] Sloane 1512.

A method of shooting guns without noise [1] excites our curiosity, but we recall that Thomas Browne classes among his Vulgar Errors the belief in a "white powder that kills without report," concerning which, he wittily remarks, "there is no small noise in the world." [2] We turn to "Experiments made at several times upon Oxe's galls," [3] to "Preparations and Experiments" and "Some excerpts from the experiments of Andreas Michelius." [4] In a manuscript which consists chiefly of recipes we find directions for making saltpeter and gunpowder and various kinds of fireworks.[5] An experimental remedy for the gout [6] carries our thoughts back to Alexander of Tralles, while a manuscript written in 1579 consists of "A book of certain experiments of physics, copied out of an old written book in old English, bearing the date of 1329, by John Nettleton, with additions of medical receipts and observations in a later hand." [7]

Magic experiments.

We come to the books of magic in the manuscripts of the seventeenth century in the Slóane collection and find them full and running over with "experiments." "An excellent approved experiment to cause a thief to come again with the goods." "An experiment to call out spirits that are keepers of treasure trove, either by an artificiall inchantment magically, or otherwise by Divine justice." "An introduction teaching the use of the foregoing treates and thereby other experiments." [8] Another manuscript has "some experiments and incantations and imperfect conjurations written by John Evans," "some experiments for sport," "an experiment with book and key to reveal the thief by the names of the suspects," and the equally superstitious experiments of William Bacon.[9] Elsewhere we meet "A magical treatise containing a number of experiments and directions to those that will call any spirit," [1] "Experiments for finding out stolen or hidden things by the help of the Chrystal Stone," "A noble experiment of King Solomon with astrological tables," [2] "Experiments for love," "Experiments for all games," [3] "the doctrine of all experiments," [4] "some magical experiments," "many experiments of magic," [5] and so on and so forth; in short, magic experiments galore.

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[1] Sloane 1731A, written about 1700, fol. 13.

[2] Browne, *Pseudodoxia Epidemica,* II, 5.

[3] Sloane 2039, fols. 112-14.

[4] Sloane 2046, fols. 67-76, 141-55.

[5] Sloane 2818, fols. 102-8, 140v-145.

[6] Sloane 3328, fol. 17.

[7] Sloane 3655, fol. 131.

[8] Sloane 3824, fols. 16-21, 89-120, 141-54.

[9] Sloane 3846, fols. 24-30, 30v, 79v-86, 93v-98.

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[1] Sloane 3847, fols. 152-9.

[2] Sloane 3849, 15th-16th centuries, fols. 17-22, 30-38.

[3] Sloane 3851, fols. 140-4, 144v.

[4] Sloane 3853, fols. 3-45, Thesaurum spirituum secundum Robertum Turconem et Rogerum Bacon," opens, "Haec est doctrina omnium experimentorum;" fols. 176-219, a magic book called *Dannet* opens, "This is the doctryne of all experiments in generall."

[5] Sloane 3853, fol. 266, Experimenta quaedam magica; fols. 54-63, 70-120, Experimenta plurima magicae.

APPENDIX I

MANUSCRIPTS OF THE LIBER VACCAE

The three first MSS in the list are those which I have used. Steinschneider (1906), p. 43, listed four MSS: Digby 71, Corpus Christi 125 and 132, and Montpellier 277. The three which I examined were wretchedly written and full of abbreviations.

Arundel 342, 14th century, Italian hand, fols. 46r-54v. The *Titulus* is "Incipit liber institutionum activorum (*sic*) Platonis in quo Humayn filius Zacarie sic loquitur dicens." The *Incipit* is "Galienus cum praeparavit ut abreviaret librum Platonis physici, qui nominatus est liber anguemis." The *Explicit* is "Expletus est liber aggregationum Anguemis Platonis cum expositione Humayn filii Ysaach gratia Dei."

Digby 71, 14-16th century, fols. 36r-56, Liber Vaccae, precepta et experimenta alchemica et magica, praemisso prologo (ut videtur) longo. Incipit prologus, "Conferat tibi Deus mores nobiles." Incipit liber (fol. 40v) "Galienus cum propter amatum voluit abbreviares (*sic*) librum Platonis philosophi qui nominatus est liber anequemis." Ad calcem (fol. 56) "Completur liber anequems Platonis id est liber vacce."

Corpus Christi 125, 13-15th century, fols. 121v-141r (141-60, according to the system of numbering which I have followed in the foot-notes of the preceding chapter). This MS repeats the first prologue, found in Digby 71 but missing in Arundel 342. It ends, "Completus est liber Anaguenis, id est, liber vaccae."

Corpus Christi 132, 15th century, fols. 139-66, has the same title and opening as the preceding.

CLM 22292, 12-13th century, fol. 68, Epistola de medicina, opening, "Conferat tibi deus mores," and ending, "Explicit epistola Ameti" (a name which usually means the astrologer Alfraganus); fol. 70, Prologus in librum Anguemis, of which the text does not seem to follow, since at fol. 72 comes a commentary on the Aphorisms of Hippocrates. In this early MS therefore we seem to have only the two prologues.

Amplon. Quarto 188, written in 1267 A. D., 1319, and later, fols. 103-4, Liber vacce seu liber aggregacionis diversorum philosophorum, opening, "Primor queritur quare risus magis sequitur titillacionem," and closing, "significet fleubotomia predominari et odor debet et etiam." From its brevity and opening and closing words this would seem to be only a fragment of our treatise. Schum states that it was originally followed in the MS by another treatise on nigromancy, since torn out, and that in the sixteenth century the two works were given the common title, "Liber vacce nigromanticus." But perhaps it is only a part of the *Liber Vacce* that has been torn out.

Florence II-iii-12, 15th century, fol. 57-, "Liber institutionum activarum Platonis in quo Himaym filius Ysac sic loquitur;" fols. 59-72, "Inquit Himayn, Galenus dixit . . . / . . . completus est liber agregationis aneguemis maioris et minoris Platonis cum expositione Imayn filii Ysac et declaratione Galieni."

The treatise was once found in the library of St. Augustine's Abbey, Canterbury, 1275, vacca platonis.

Among MSS which T. Allen had in 1622 but which are no longer in the Digby collection was, in 16mo, Liber Anequems Platonis, id est, Liber vaccae.

APPENDIX II

MANUSCRIPTS OF THE SECRETUM PHILOSOPHORUM

Of the following MSS I have chiefly used Additional 32622, Digby 37, and Digby 153.

CU Trinity 1214, good hand of late 12th century, fols. 71-82, is perhaps an earlier precursor of our treatise, judging from the following headings given by James: "De aque ductibus, de puteis fodiendis, de probatione aque . . . de fistulis organicis . . . de calce . . . de fabrica ville rustice disponenda, de balneis . . . de coloribus . . . de norme institutione, de horologii institutione . . . de solidamentis, de altitudine arborum sive turrium probanda, probacio auri, de arte multiplicandi, de arte organizandi."

Amplon. Quarto 330, mid 13th-early 14th century, fols. 1-23, appears to be the earliest of the MSS of our treatise.

Amplon. Quarto 361, English hand of early 14th century, fols. 27-40.

Additional 32622, small octavo written in England in early 14th century, fols. 3-84, "Iste liber quem prae manibus habemus vocatur Secretum philosophorum, et intitulatur isto nomine quia in eo continentur quaedam secreta quae reputatione vulgari sunt impossibilia, apud philosophos secreta et necessaria."

Additional 18752, small quarto, 14-16th century, fols. 1-28, "Secretum philosophorum," imperfect.

Sloane 2579, fol. 2-.

Egerton 2852, mid 14th century, fols. 5v-49v.

Digby 37, 14th century, fols. 4-43, "Secretum philosophorum."

Digby 71, 14-16th century, fols. 85-97, *Titulus* as in Addit. 32622, imperfect, leaving off in the midst of "Arithmetic."

Digby 153, 14th century, fols. 148-67v.

Rawlinson C, 7, 14th century, fols. 51-87, mutilated at close.

Corpus Christi 132, 15th century, fols. 1-59, *Titulus* as in Addit. 32622 and Digby 71.

CU Trinity 1082, 15th century, fols. 1-110.

CU Trinity 1144, late 15th century, fols. 9-54v.

CU Trinity 1351, late 15th century, fols. 1-25, James gives no general title, but his description is sufficient to identify it with our treatise.

Gonville and Caius 413, 15th century, #4, 31 fols.

CHAPTER LXVI

PICATRIX

Problem of date and authorship—Law of Alfonso the Wise concerning magic and astrology—Picatrix a confused compilation—Its mentions of magic—Magic and science—Its use of natural virtues—Magic compounds—Things required of the magician—Magic procedure—Invocation of spirits—Necromancy and astrology—Astronomical images—Aims and results of magic—Appendix I. Manuscripts of *Picatrix.*

"Scientia . . . semper acquirit et numquam diminuit; semper elevat et numquam degenerat; semper apparet et numquam se abscondit."

Problem of date and authorship.

ANOTHER celebrated medieval book of magic is that which usually goes by the name of *Picatrix,* who is, however, cited in the work itself [1] and would seem to have been only one of its authors, translators, compilers, or sources. Nevertheless he is mentioned as author in the title, *Incipit,* and *Explicit* of the manuscripts,[2] and is called "very wise," "a philosopher," "most skilled in mathematics," and "very learned in the arts of necromancy." The treatise is also said to have been compiled by Norbar the Arab in the twelfth century.[3] The Latin manuscripts state that in 1256 it was translated from Arabic into Spanish by order of Alfonso the Wise; but when it was translated into Latin is not stated. There seem to be no Latin manuscripts older than the fifteenth century, and none of our thirteenth century Latin writers seems to have been acquainted with the work. Peter of Abano, it is true, is charged by Symphorien Champier, writing in 1514,[1] with having borrowed from *Picatrix*, but Champier does not substantiate his charge and I have found no unmistakable evidence of it in Peter's works. Evidently, however, *Picatrix* was well-known in Latin by 1514. Rabelais, who lived from 1495 to 1553, speaks of "le reuerend pere en Diable Picatris, recteur de la faculté diabolologique" at Toledo.[2] A Cambridge doctor about 1477 cites "Picatrix in his third book of magic." [3] The work seems never to have been printed and J. Wood Brown expresses the hope that it may never be translated into any modern language.[4]

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[1] II, 10, "Haec autem figurae planetarum quemadmodum translatas invenimus in lapidario mercurii et in libro beelum (probably meant for Beleni) et in libro spirituum et in ymaginibus quas transtulit sapiens picatrix." Magliabech. XX, 20, fol. 32v; Magliabech. XX, 21, fol. 14v.

[2] For a list of MSS see Appendix I at the close of this chapter.

[3] J. Wood Brown (1897), p. 183; Arpenius, *De prodigiosis naturae,* Hamburg, 1717, p. 106.

Law of Alfonso the Wise concerning magic and astrology.

It was fitting that such a work should have been translated from the Arabic under the patronage of Alfonso X, the Wise or Learned, who is noted for his astronomical tables, and whose favorable attitude toward astrology and magic may be seen from the law on those subjects in his code of the Seven Parts.[5] Divination of the future by the stars is sanctioned in the case of persons properly trained in astronomy, although other varieties of divination are forbidden. And while those who conjure evil spirits or who make waxen, metallic, or other images with the aim to harm their fellows are to be punished by death; those who employ incantations with good intentions and good results are pronounced deserving of reward rather than penalty. Thus no objection is made to magic procedure but only to evil intentions and results.

Picatrix a confused compilation.

Picatrix divides into four books and is accompanied in the manuscripts by tables of contents which, however, are not as helpful as might be expected, since the work really has no plan and the division into books and chapters is quite arbitrary.[1] In short, the work is a confused compilation of extracts from occult writings and a hodgepodge of innumerable magical and astrological recipes. The author states that he "has compiled this book," that he intends to set forth "in simple language" what past sages have concealed in cryptic words, and that he has spent some six years in reading two hundred and twenty-four books by "ancient sages." [2] Whenever modern compilers of the notions of folk-lore and the magical customs of aborigines shall have exhausted their resources, a rich mine will still await them in this book of magic. We can give but a few specimens of its contents here.

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[1] In a criticism of Abano's "errors" printed at the close of the 1526 edition of the Conciliator, fol. 248.

[2] *Pantagruel*, III, 23.

[3] Steinschneider (1905), p. 61, and Ashmole 1437; see Appendix I.

[4] Brown (1897), p. 183, note 1.

[5] *Los Códigos Españoles concordados y anotados: Código de las siete partidas*, second edition, Madrid, 1872, vol. IV. *La setena partida: Titulo* XXIII, *Ley* 1-3. There is an article on the astronomical works of Alfonso X by A. Wegener in *Bibl. Math.* (1905), 129-85.

Mentions of magic.

For *Picatrix* is openly and professedly a book of magic. At the close of the first of its four books we are told that its contents are "the roots of the magic art" and that "without them one cannot become perfect in such arts." [3] Throughout all four books such phrases are used as "magic works," "magic effects," "magical sciences," and "the operator of magic," and books of magic are cited by Abrarem (Abraham?), Geber, and Plato.[4] It is true that the term necromancy is also employed frequently and a chapter devoted to its definition,[5] and that astrological images and invocations of demons are the subjects most discussed. So in a way the work is primarily a treatise of astrological necromancy. But it is said on the supposed authority of Aristotle that the first man to work with such images and to whom spirits appeared was Caraphrebim, the inventor of the magic art.[6] It is also affirmed that the science of the stars is the root of magic, that the forms of the planets or astronomical images "have power and marvelous effects in magic operations;" while after announcing his intention of listing "the secrets of ancient sages in the magic art," the first thing that our author divulges is that the influence of Saturn exceeds the influence of the moon.[1] Evidently little distinction is made between astrology and magic. On the whole then, although magic is not defined at length in *Picatrix,* it seems justifiable to apply it as a general term covering the contents of the book, and to regard astronomical images and invocations of demons as two leading features of the magic art.

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[1] J. Wood Brown (1897), p. 183, gives a wrong impression that the work is systematically arranged.

[2] Magliabech. XX, 20, fols. 1v and 53r. Future citations in this chapter, unless otherwise noted, will be from this MS.

[3] Fol. 15v.

[4] Fols. 7v, 44r, 44v, 22v, 23r, 28r, 40r, 50r, 51r, 99r. Magliabech. XX, 21, fols. 78r and 79v.

[5] Liber I, cap. 2, which is much briefer in Magliabech. XX, 21 than in XX, 20.

[6] Fol. 55v.

Magic and science.

Picatrix regards magic as a science, as a superior branch of learning, to excel in which one must first master many other studies. He believes that the greatest philosophers of antiquity, such as Plato and Aristotle, have written books of magic. Hermes is also cited frequently. Our author also has a high appreciation of science which in his first chapter he declares to be God's greatest gift to man. "It always is making acquisitions and never diminishes; it ever elevates and never degenerates; it is always clear and never conceals itself." [2]

Use of natural virtues.

Much use of natural objects is made in the various recipes of *Picatrix*. Here is one brief example: Adam the prophet says that if you take fourteen grains of the fruit of the laurel tree, dry them well and pulverize them and put the powder in a very clean dish in vinegar, and beat it with a twig from a fig tree, you can make anyone you wish possessed of demons by giving him this powder to drink.[3] One chapter is especially devoted to "the virtues of certain substances produced from their own peculiar natures," and the author further explains that "in this section we shall state the marvelous properties of simple things, as well of trees as of animals and of minerals.[4] Hermes is quoted as saying that there are many marvels for necromancy in the human body,[5] and various parts thereof are often employed by

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[1] Fols. 32v and 28r.

[2] "Semper acquirit et numquam diminuit; semper elevat et numquam degenerat; semper apparet et numquam se abscondit."

[3] Magliabech. XX 21, fol. 79v.

[4] IV, 8, fol. 108v; Magliabech. XX, 21, fol. 86r.

[5] Magliabech. XX, 21, fol. 60v.

Picatrix. Thus in making a magic mirror a suffumigation is employed of seven products of the human body, namely, tears, blood, ear-wax, spittle, *sperma, stercus, urina.*[1] Indeed, vile and obscene substances are in great demand for purposes of magic throughout the book. Picatrix, like the *De mirabilibus mundi,* considers heat an important force in magic and mentions both elemental and natural heat, the former referring to the use of the element fire in sacrifice, suffumigation, and the preparation of magic compounds, the latter designating the heat of digestion when simples or mixtures must be eaten to take effect.[2]

Magic compounds.

Although we have found one chapter devoted to the virtues of simples, in actual magical procedure several things are generally combined, as in a suffumigation with fourteen dead bats and twenty-four mice, to give a comparatively simple example.[3] On the supposed authority of Aristotle in a book written to Alexander, detailed instructions are given how to make four "stones" of great virtue and of elaborate composition by procedure more or less alchemistic.[4] Indeed, there are listed all sorts of "confections," compounds, and messes, either to burn or to sacrifice or to eat or to drink or to smell of or to anoint oneself with, in order to bring various wonders to pass. The ingredients employed include different oils and drugs, butter, honey, wine, sugar, incense, aloes, pepper, mandragora, twigs, branches, adamant, lead, sulphur, gold, the brains of a hare, the blood of a wolf, the urine of an ass, the filth of a leopard, and various portions of such further animals as apes, cats, bears, and pigs. Besides the actual ingredients all sorts of receptacles and material paraphernalia are called into requisition: vessels, jars, vases, braziers, crosses, candles, crowns, and so on.

Things required of the magician.

Much is said of the magician himself as well as of the materials which he employs. He should have faith in his procedure, put himself into an expectant and receptive mood, be diligent and solicitous.[5] Often chastity is requisite, sometimes fasting or dieting, sometimes the wearing of certain garments.[1] He must have studied a long list of other sciences before he can attempt necromancy, but then he must drop all other studies and devote himself to it exclusively. A little knowledge of necromancy is a dangerous thing, and the ignorant meddler therein is liable to be violently slain by indignant demons.[2] Much depends also upon the magician's personality and natural fitness. No one can succeed in the science of images unless his own nature is inclined thereto by the stars. Some men are more subtle and spiritual, less gross and corporeal than others, and hence more successful in magic.[3] The ancients, when they wished to employ a boy in magic, used to test his fitness by fire as well as make sure that he was physically sound.[4]

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[1] Magliabech. XX, 21, fol. 22v.

[2] I, 2.

[3] Fol. 70r.

[4] III, 10, fol. 73v; Magliabech. XX, 21, fol. 53r.

[5] I, 4.

Magic procedure.

It has already been implied that great stress is laid upon procedure in *Picatrix*. Extensive use is made of images of the person or thing concerned. Thus an image of a fish is employed to catch fish, and to bewitch a girl a waxen image of her is made and dressed in clothes like hers. In both cases, however, there is additional ceremony to be observed. In the image of the fish the head should first be fashioned; furthermore the image of the fish is to be poised on a slender rod of silver and this is to be stood erect in a vessel filled with water. This vessel is then to be hermetically sealed with wax and dropped to the bottom of the stream in which it is proposed to fish.[5] In the bewitching of the girl, which is recounted as an actual occurrence, the object was to make her come to a certain man. Hence another image was made of him out of a pulverized stone mixed with gum, and the two images of man and girl were placed facing each other in a vase where seven twigs of specified trees had been arranged crosswise. The vase was then buried under the hearth where there was a moderate fire and a piece of ice. When the ice had melted, the vase was unearthed and the girl was immediately seen approaching the house. In the reverse process to free her from the spell a candle was lit on the hearth, the two images were taken out and rudely torn apart and an incantation uttered.[1] To make a spring that is going dry flow more freely a small and comely virgin should walk up and down beating a drum for three hours, and then another small and good-looking girl should join in with a tambourine for six hours more. To ward off hail storms a company of people should go out in the fields, half of them tossing handfuls of silk or cotton (*bombix*) toward the sky and the other half clapping their hands and shouting as rustics do to frighten away birds.[2] Tying seven knots and saying an incantation over each is another specimen of the ceremonial in *Picatrix*.

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[1] II, 12; III, 5 and 7 and 12.

[2] IV, 5.

[3] III, 6 and IV, 1.

[4] Magliabech. XX, 21, fol. 47v.

[5] Fol. 10.

Invocation of spirits.

Ritual also plays an important part in the invocation of spirits. If one wishes to invoke the spirit called "Complete Nature" he must enter a spick and span room while the moon is in the first degree of Aries. Various receptacles filled with different foods and combustibles must be arranged in a certain way on a table. Then he must stand facing the east and invoke the spirit by its four names seven times and repeat a prescribed form of prayer for increase of knowledge and of moral strength.[3] To draw down the virtue and power of the moon one crowns oneself in the favorable astrological hour and goes to a green spot beside a stream. There he beheads with a bone—under no circumstances employing iron —a cock with a divided crest. He stands between two braziers filled with live coals on which he casts grains of incense gradually until smoke arises; then, looking toward the moon, he should say, "O moon, luminous and honored and beautiful, thou who shatterest darkness by thy light, rising in the east and filling the whole horizon with thy light and beauty, I come to thee humbly asking a boon." Having stated his wish, he withdraws ten paces, facing the moon the while and repeating the above formula. Then more incense is burned and a sacrifice performed and characters inscribed on a leaf with the ashes of the sacrifice and a bit of saffron. This leaf is then burned, and as its smoke rises the form of a well-dressed man will appear, who will answer the petition.[1]

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[1] Fol. 52.

[2] Fol. 103v; Magliabech. XX, 21, fols. 81v, 82r.

[3] III, 6. Fols. 54-55; Magliabech. XX, 21, fols. 32-34.

Necromancy and astrology.

Throughout *Picatrix* planets and spirits are closely associated. Many instructions are given how to pray to each of the planets and to work magic by their aid, just as if they were demons. It is hard to say whether the spirits are more thought of as forces in nature or the stars as gods. A necromancer who does not know astronomy is helpless, and each planet has a list of personal names associated not only with itself but with its every part and position.[2] Lists are also given of the boons which one may ask from each planet, and of the stones, metals, animals, trees, colors, tinctures, odors, places, suffumigations, and sacrifices appropriate to each planet and sign of the zodiac, in order that one may use the proper materials, eat the right food, and wear the right clothes when petitioning any one of them.[3] Let us remember, too, that the natural qualifications of the magician depend upon his horoscope.

Astronomical images.

Finally *Picatrix* devotes much space to astronomical images,[4] which, engraved preferably upon gems in accordance with the aspect of the sky at some instant when the constellations are especially favorable, are supposed to receive the celestial influences at their maximum and store them up for future use. That they receive "the force of the planets" and produce marvelous works, such as the invocation of demons, is in our author's opinion "proved by nature and by experiment." He lists images for forty-eight figures made from the fixed stars, for the twenty-eight mansions of the moon, for the signs of the zodiac and for the planets. One of the images for Saturn will suffice as an example: "A man erect on a dragon, holding a sickle in his right hand

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[1] IV, 2. MS XX, 21, fol. 68v.

[2] III, 9, MS. XX, 20, fol. 71r. MS. XX, 21, fol. 50r.

[3] II, 5 and 10; III, 1 and 2.

[4] Liber II, *passim:* also I, 4-5 and IV, 9.

and a spear in his left hand, and clad in black clothing and a panther skin." This image "has power and marvelous effects in magic works." [1] Characters composed of lines and geometrical figures are also derived from the constellations and are supposed to possess marvelous efficacy.

Aims and results of magic.

Some of the results attributed to images and characters are to drive away mice, free captives, throw an army into a town, either render buildings safe and stable or impede the erection of them, the acquisition of wealth, making two persons fall in love, making men loyal to their lord, making the king angry with someone, curing a scorpion's sting, walking on water, assuming any animal form, causing rain in dry weather and preventing it in rainy weather, making the stars fall or sun and moon appear divided into many parts. The possessor of such images can further ascend into the air and take on the form of a falling star, or speak with the dead, or destroy an enemy or city, or traverse great distances in the twinkling of an eye. The aims of incantations, invocations, and recipes are similar, as has already been indicated in several cases. Ten "confections" are listed that stop evil tongues; eight, that generate discord and enmity; six, that cure impotency, if taken in food; seven, that induce a sleep like unto death; ten, that induce a sleep from which one never wakes.[2] Others prevent dogs from barking at you, produce green tarantulas or red snakes, remove bothersome frogs from pools, cause water to burn and appear red, enable you to see small objects a long way off, make the winds and tempests obey you, deprive others of memory or sense or speech or sight or hearing, and so on through a long list. The aims are infinitely varied, and are sometimes good, sometimes evil.

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[1] II, 10; fol. 32v; Magliabech. XX, 21, fol. 14v.

[2] III, 11; fol. 78v; Magliabech. XX, 21, fol. 58v.

APPENDIX I

MANUSCRIPTS OF PICATRIX

I have chiefly used Magliabech. XX, 20 and XX, 21, two MSS now preserved at the National Library at Florence and originally written at Rome in 1536, as an identical colophon in either MS states. Otherwise, however, their contents are often not identical although roughly corresponding. I have also examined Sloane 1305 and found it in general similar to the other two.

Vienna 3317, 15th century, 114 fols., Picatrix, De magia, "Ad laudem et gloriam altissimi . . . / . . . fel leonis est."

Magliabech. XX, 20, 1536 A. D., fols. 1-117v, "Liber Piccatrix sapientissimi Philosophi in necromanticis artibus excellentissimi de Arabico in Hispanicum primum traductus postea in Latinum conversus. Alphonsus Rex Hispaniae totiusque Andalutiae precepit primam traductionem summa diligentia. Hoc autem opus perfectum fuit Anno MCCCLVI" (probably should be 1256, referring to the Spanish rather than Latin translation). The foregoing occurs two leaves before the book proper begins and is in a larger print-like hand than the text itself, which opens: "Alibi incipit liber excellentissimi viri picatrix picatrici Hispanensis." The Proemium then opens, as also in Sloane 1305 and 3679, "Ad laudem et gloriam altissimi dispotentis (disponentis) Dei cuius est in vellariis suis praedestinans feliciter secreta scientiarum ad illustrationem et doctrinam latinorum quibus est inopia librorum ab antiquis philosophis editorum Alfonsus Dei gratia prosperrimus rex Hispaniae totiusque Andalitiae igitur (ego) precepit hunc librum summo studio summaque diligentia de Arabico in hispanicum transferri cuius nominem (nomen) est piccatrix. Hoc autem opus perfectum fuit anno Domini 1356 (1256) Caesaris 2285 (1295) Alexandri 1569 (2568)." The parentheses inclose variant readings from other MSS. The work closes, "Et sic finitur liber sapientissimi piccatricis in Math. die vigesimo primo mensis maii hora vigesima prima brasichelle in domo que est in platea a duobus faciebus et iuxta pallacium communis currentibus annis a salutifera nativitate millesimo quingentesimo trigesimo sexto inditione nona anno secundo pontificatus Pauli tertii ad dei laudem et gloriam in infinita.

Qui servare libris preciosum nescit honorem
Illius a manibus sit procul iste liber.
Telos."

Magliabech. XX, 21, 1536 A. D.

Sloane 1305, 17th century, fols. 1-153, (Johannis) Picatricis, Philosophi, Liber de Coelo, in partes quatuor distinctus, cum prooemio, tabula uniuscuiusque libri capitulorum et auctorum e quibus compilatur opus nominibus praemissis. Praefigitur prooemio, "Alphonsus (X) Dei gratia illustrissimus Rex Hispaniae totiusque Handulatiae praecepit hunc librum summo studio summaque diligentia de A(rabico) in Hispanicum transferri, cuius nomen est Piccatrix. Hoc autem opus perfectum fuit anno Domini 1256, Alexandri 1568, Caesaris 1295, Arabum 55, ex 200 libris philosophia(e) et pluribus compilavit qui suo proprio nomine nominavit." Incipit prooemium, "Incipit liber quem sapientissimus Philosophus Piccatrix in Necromanticis artibus ex quam pluribus libris composuit. Ut sapiens ait, primum quod agere debemus in omnibus rebus mundi est Deum orare." Incipit partis primae cap. I, "De scientia cognoscendi in quo gradu es. Scias, O homo, quod maius donum." Desinit pars ultima, "et dum comburitur, legas supradicta nomina et ex hoc amor et amicitia movebitur." "Et sic finitur Liber totus sapientis Piccatricis in Mathematicis peritissimi. Deo optimo maximo; gratias in aeternum agamus."

Sloane 3679, 17th century, fols. 1-73, in the usual four parts and with a table of contents.

Sloane 1309, 17th century, 69 fols., in Italian, "Delli Experimenti di Gio Peccatrix."

BN 7340, 17th century, #1, Picatricis Hispani astrologia tribus libris.

BN 10272, 15th century, and 10273, 17th century, Traité de nécromancie 'Picatris.'

BN 13016 and 13017, 17th century, Liber Picatricis hispani, two copies.

BN 17871, early 16th century, Picatrix.

Arsenal 1033, 17th century.

Steinschneider (1905) p. 61, discusses Picatrix and calls attention to Cod. Reg. Suec. 505 at the Vatican, but fails to note the Sloane MSS or those at Florence and omits some of those at Paris—but adds a Paris Supplem. 91—and incorrectly cites Ashmole 1179. He means Ashmole 1437, 15th century, a commonplace book of a Cambridge doctor, Johannis Argentin, where there is a citation of "Picatricem (secundum) in tertio libro sue magice." "1179" is the number of the column in Black's Catalogue of the Ashmolean MSS, from which Steinschneider derived this information, and I presume that he mistook it for the number of the MS itself. Steinschneider notes that in Hanover 396, 17th century, a work of magic in Italian, Picatrix is spoken of as a Hebrew philosopher, and that in the aforesaid Ashmole MS are "Tabulae motionis octavae spherae moventis ab occidente ad orientem octo gradus in 640 annos secundum ordinem Picatricis."

CHAPTER LXVII

GUIDO BONATTI AND BARTHOLOMEW OF PARMA: AN ASTROLOGER AND A GEOMANCER

Guido Bonatti and Dante—The *Liber astronomicus* of Guido Bonatti—Career of Bonatti—Arrangement of the *Liber astronomicus*—Astronomy and astrology—Truth of astrology—Theological opposition—Bonatti's defiant rejoinder—Astrological predictions for Christians and the clergy—Instances of Bonatti's detailed treatment—The planet Jupiter—An astrological image—The *Geomancy* of Bartholomew of Parma—How to proceed in geomancy—Questions answered by geomancy—Appendix I. Some Manuscripts of the *Liber Astronomicus* of Guido Bonatti.

"Vedi Guido Bonatti. . . ."
—*Inferno, XX, 118.*

Guido Bonatti and Dante.

WITH these words Vergil calls the attention of Dante and ourselves to the presence of that astrologer in the fourth division of the eighth circle of the Inferno among those spirits who in life had tried to pry too far into the future and were condemned henceforth to look backwards with turned heads. This is all that Dante says of Bonatti, although Benvenuto of Imola, the fourteenth century commentator upon the *Divine Comedy,* adds a number of tales concerning him, some of which may be true but most of which are stock stories like that of the speaking brazen head, told of many other medieval men of learning. But we may perhaps associate Bonatti and Dante in our minds a little further. Forlì, Bonatti's native city, lies almost in a direct line between Florence, where Dante lived his early life, and Ravenna, where he ended his exile. Indeed, Filippo Villani [1] and Fossi [2] would persuade us that Guido Bonatti, too, was born a Florentine but, like Dante, became an exile from the town of his birth and called himself a native of Forlì because he came to hate the place of his birth which he had left on account of the strife of political factions. Finally, Bonatti and Dante had a common interest in astronomy.[1]

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[1] Cited by Boncompagni (1851), p. 5.

[2] Fossi (1793-5), p. 395.

The *Liber astronomicus* of Guido Bonatti.

The most important astrological work produced in Latin in the thirteenth century seems to have been the *Liber astronomicus* of this Guido Bonatti,[2] which is a voluminous work divided into some ten or a dozen treatises.[3] In the preface, after some of the usual devout opening phrases of medieval authors, Guido states that he writes the book particularly for the use of his nephew, that the work will be "long and prolix" and that on this account he will not include "disputations nor many proofs." He proposes to compile a work from past authors which can be understood by those who do not yet know much of other sciences "and especially for your use, Bonatus, my nephew." Indeed, the annalist of Forlì states that Bonatti expounded the doctrine of astrology so clearly in this book that "it seemed as if he wished to teach women astrology."[4] Guido employs such classical authorities as Ptolemy, Hermes, and

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[1] Orr (1913), p. 4, says: "Where Dante speaks of appearances he is remarkably accurate, far more so than most modern artists and writers of fiction."

[2] My citations, unless otherwise specified, will be to the following edition of Augsburg, 1491: *Liber astronomicus Guidonis Bonati de forlivio explicit feliciter. Magistri Johannis Angeli viri peritissimi diligenti correctione Erhardique Ratdolt viri solertis eximia industria et mira imprimendi arte qua nuper Veneciis nunc Auguste Vindelicorum excellit nominatissimus. Septimo kal. Aprilis, 1491.* Quarto, 422 leaves, no pagination. There is a copy of this edition at Columbia University in this country and not merely at Brown, as stated in CFCB.

Other editions of the Latin text were printed at Venice, 1506; and at Basel in 1530 and 1550.

For a list of MSS of the work see Appendix I to this chapter.

[3] The titles more often speak of ten treatises, but some of these sub-divide into two or more lesser treatises. Such sub-division and combination also varies in different editions and MSS, and the order of the component treatises also varies. In the edition of 1550, for instance, the work is divided into six parts, of which the first contains what are usually listed as the first five or six of the ten or twelve component treatises. But the order of the edition of 1550 is the same as in that of 1491, while in Arundel 66 the order of the last six treatises is different.

[4] Muratori, *Rerum Italicarum Scriptores,* revised edition, Fasc. 20, 1903, p. 104.

Dorotheus, but still more such Arabian astrologers as Alcabitius, Albumasar, Messahala, and Thebit ben Corat.[1] He also states that he has made additions of his own,[2] and many passages demonstrate that he has made detailed practical application to the present problems of medieval life of the principles of his art established in the past. The popularity and influence of Guido's work is attested by the numerous manuscripts, including an interesting *de luxe* manuscript of it and other astrological treatises made for the use of Henry VII of England, whose picture is given in the midst of Bonatti's text.[3] There are also several printed editions of the Latin text and translations of the work into several modern languages. There is an Italian translation of it in a manuscript in the Laurentian library at Florence; a German translation was printed at Basel in 1572; and an English translation by William Lilly appeared in print at London in 1676.[4] Thus Dante's consignment of Bonatti's soul to hell does not seem to have kept people from reading his *Liber astronomicus.*

Career of Bonatti.

The battle of Valbona, fought in 1277, seems to be the latest event mentioned by Bonatti. He also speaks of having himself seen many evidences of the cruelty of Ezzelino, and of that tyrant's death, which occurred in 1259. He was alive as early as 1223, when he mentions having seen a certain man.[5] Guido seems to have been a professor at the university of Bologna. He must have died before 1300, when Dante's visit to the Inferno is supposed to have occurred. Bonatti's death, however, would seem to have been comparatively recent, since the *Annals of Forlì*[1] represent him as playing a prominent part in the defense of that town in 1282 by the famous captain, Guido of Montefeltro, against a large force sent by Pope Martin IV. Though Bonatti himself was loyal, it was in a wheat field belonging to him that conspirators gathered in a vain attempt to betray the town, while the enemy later encamped outside the city in another field belonging to him and called, "Of the oak tree."

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[1] Some others mentioned are, II, ii, 1, Atezdegoz, Adila, Alhayat, Astaphan, Arastellus; these are probably indirect citations. Elsewhere Aoma (Haomar) and Aboali (Haly) are mentioned.

[2] *Ibid.*, "Et addendo ea quae mihi utilia videbuntur."

[3] Arundel 66, membr. folio maximo, fols. 48-249.

[4] *Will. Lilly, Student in Astrology, Anima Astrologiae; or a Guide for Astrologers: being the Considerations of the famous G. Bonatus rendered into English: as also the choicest Aphorisms of Cardan's VII Segments,* London, 1676.

[5] For the sources of these events see *Della vita e delle opere di Guido Bonatti astrologo ed astronomo del secolo decimoterzo, Notizie raccolte da B. Boncompagni, Roma, 1851. Estratte dal Giornale Arcadico, Tomo CXXIII-CXXIV.*

Then Guido of Montefeltro, we are told, "captain of the people of Forlì, together with lord Guido Bonatti, a citizen, philosopher, and most eminent astrologer, having called the people together in the public square," instructed them as to the strategem of a mock withdrawal from town and subsequent return by which he intended later to take the superior forces of the enemy unawares after they had entered the town in triumph and were overcome by feasting and drinking. The strategem turned out a complete success, and the *Annals* give much of the credit to Bonatti, by whose counsel, art, and forecasting the future it is said to have been planned. He was wounded in the battle, while carrying medicines, but this too he had foreseen and foretold. Later, when the pope sent more mercenary troops into Romagna, Forlì deemed it prudent to submit, and Guido of Montefeltro transferred his military activities elsewhere and finally, we are told, made his peace with the pope and spent his declining years in the Franciscan Order. Some say that Bonatti followed his patron into the convent, but it seems very improbable in view of the hard things which he had said of the friars. On the other hand, judging from the number of Franciscans who have written works on astrology and astrological medicine, he might not have found such retirement entirely uncongenial, and need scarcely have surrendered his astrological views in consequence.

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[1] Muratori, *Rerum Italicarum Scriptores,* revised edition, Fasc. 20, 1903, pp. 37-8.

Arrangement of the *Liber astronomicus.*

But we turn to the contents of the *Liber astronomicus.* Bonatti's first treatise is a general introduction in which he defines his subject, discusses its utility, and meets the objections of its opponents. The second treatise [1] deals with the signs of the zodiac and their characteristics and subdivisions. The third treatise, in two parts,[2] deals with the planets, their influences on things on earth and their effects on one another. The fourth treatise deals chiefly with conjunctions. The remaining treatises comprise 146 considerations affecting astrological judgments, another brief introduction of three chapters to the subject of judgments,[3] discussions of the four chief departments of astrological prediction, interrogations, elections, revolutions, and nativities, and a final treatise upon prognostication of changes in the weather.[4]

Astronomy and astrology.

As the title, *Liber astronomicus,* shows, Bonatti generally uses the word "astronomy" where we should say "astrology" and *vice versa.* He states, for instance, that nativities, elections, interrogations, and revolutions are four varieties of "astronomy," which he distinguishes from other forms of divination.[5] He also says, however, that the words "astronomy" and "astrology" may be used interchangeably. He regards both as of great value in the study of first philosophy. Through these sciences we come to know impassive and unalterable creatures who cannot be changed into any other essence, and through these creatures we can attain to as much knowledge of the Creator as the human mind can reach. Nobler than the profession of the physician who deals with the four inferior and corruptible elements is that of the astrologer whose concern is with superior and incorruptible bodies composed of the fifth essence.[1]

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[1] In the 1491 edition it divides into three parts; in Arundel 66 it is divided into two treatises listed as the second and third of the work.

[2] In Arundel 66 these are listed as books 4 and 5, and have a different division into chapters.

[3] If we wish to reckon only ten treatises, this must be combined with the following treatise on interrogations.

[4] As has been stated in a previous note, the order varies in different MSS. In Arundel 66 the 146 considerations come later between nativities and revolutions. In Vienna 2359 the treatise on revolutions follows that on weather prediction.

[5] I, 11-12.

Truth of astrology.

Bonatti asserts confidently and vehemently all the main suppositions of the astrological art. He affirms that its principles ought not to be proved but assumed, since they all reduce to one point which he does not believe that anyone doubts, namely, that the motion of the heavens surrounding the elements alters fire and air and that these alter the other elements, earth and water.[2] "All wise men agree in this, that inferiors are ruled by superiors." [3] The astrologer understands every motion of each heavenly body; therefore he knows what impressions they make and what their significations are. "Therefore all things which are being done now or have existed in the past or will be done in the future, can be known by the astrologer." [4]

Theological opposition.

It will hardly be profitable for us to follow Bonatti's rehearsal of familiar arguments for and against the influence of the stars and the practicability of the art of astrology. But we may well note those passages in which he suggests the existence of a contemporary ecclesiastical and theological opposition to his art. Bonatti at least does not appear to have any fear of the clerical detractors of astrology, of whom he speaks quite disdainfully, hurling back at them the charges of heresy which they had perhaps directed at him. "I would have you know," he affirms in the introduction to his treatise on Elections, "that fortune rules in everything, although some fools among those wearing the tunic (that is, the friars) may say that fortune does not exist, but only what God wills. But the wiser of them dissent from this in secret, although they may seem to assent in public, rather from fear that their Orders be thought less of than from a conviction of its truth. For if fortune did not exist, who would be so stupid as not to know how to acquire at will an abundance of the necessaries of life? Yet we daily see quite the contrary. For do you not see wise men of integrity and intelligence who do not have enough to eat?" Bonatti consequently contends that those who deny the existence of fortune "impute madness to their Creator, falsely representing Him as unjust, and falling into a hateful heresy." He then continues, "And although at times many fools and idiots in tunics have arisen against me, declaring elections to be of absolutely no value, nevertheless elections and the other parts of astronomy have stood in their strength, nor has their truth diminished any on this account."

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[1] I, 1.

[2] I, 2.

[3] I, 5.

[4] I, 3.

Bonatti's defiant rejoinder.

As for those self-styled theologians who object that the stars are so countless in number that their influence cannot be measured and estimated, Bonatti assures them that astrologers know vastly more about the stars than the theologians do about God, "Of Whom they none the less preach daily." [1] He further asserts that the holy fathers of old employed astrology, that Abraham taught it to the Egyptians, and that Christ implied the truth of the doctrine of elections. For when the disciples endeavored to dissuade Him from returning to Judea, where recently He had been nearly stoned to death, He replied, "Are there not twelve hours in the day?" meaning that He might now select a more fortunate time than before. "And this makes it plain that He used elections and did not blaspheme astronomy as some jealous detractors do today." Bonatti then mentions "some silly fools, of whom that hypocrite, John of Vicenza, of the Order of Preaching Friars was one, who said that astrology was neither an art nor a science." Guido scarcely thinks it worth while to notice such men.[2] This John of Vicenza mentioned by Bonatti was the well-known friar of that name to whom manifold miracles were attributed and who in the Alleluia year of 1233 had been made duke of Vicenza, but so abused his power that he was soon imprisoned and discredited. Bonatti complains that no one had ever seen a single one of the eighteen men whom John was said to have raised from the dead, and affirms that he himself long sought in vain for anyone who had either been cured by John or had himself witnessed one of John's miracles.[1] On the other hand, the friar Salimbene tells us in his *Chronicle* that Guido Bonatti, who reviled the preaching of the friars, "was so confounded by" a "Brother Ugo before the university and people of Forlì that he not only feared to speak, but even to show himself during all the time that the Brother was in those parts." [2] But perhaps Brother Hugo was one of those persons whom Guido thought it scarcely worth while to notice.

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[1] I, 4.

[2] I, 13.

Astrological predictions for Christians and the clergy.

Against these allusions to an opposition to astrology among the friars, or at least, among the Dominicans, should be set other passages which indicate that Bonatti's book is intended for the use of Christians and even of the clergy, whose preaching and practice anent astrology seem divergent. One of the illustrations which he employs against those who argue that it is better not to know the future, since to learn of ills beforehand will only make one so much the sadder, is that even if one learns that his disease is fatal, he is forewarned to make his will and receive the last sacrament in season.[3] Among the interrogations which Bonatti lists are whether a bishopric or abbotship or cardinalate, or other clerical dignity, rank, or order, even up to the papacy, will be attained by the inquirer.[4] In this connection Guido grants that it may not seem honorable to seek ecclesiastical offices, but that the fact is that many clergy do it and that it is necessary for the astrologer to be prepared to answer them, if they consult him as to their prospects. In the treatise on elections instructions are given how to choose the favorable hour for building churches as well as castles and cities. The treatise on revolutions tells what will be the state during any year of the bishops and other secular clergy or the religious and regular clergy, as well as of other social classes such as kings or princes, rich men or magnates, soldiers, women, merchants, populace, and serfs. Indeed, that even a Preaching Friar in the middle ages was not necessarily opposed to astrology, is seen from an Oxford manuscript of the fifteenth century, where not far from *Rules one should know concerning various matters relating to the sick, according to Guido Bonatti and others,* is a treatise in astrological medicine by Nicholas of Aquila of the Order of Preachers.[1]

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[1] *Liber astronomicus*, 1491, fol. 99.

[2] MG *Scriptores*, vol. 32, p. 163.

[3] I, 9.

[4] In this connection it may be noted that Wolfenbüttel 2637, 15th century, fols. 132-42v, contains "Prognostications for Pope Paul II's forty-eighth year (1466) according to Guido Bonatti," and also other astrological predictions which were sent to that pope: fols. 325-34, Prognostica de rumoribus et motibus currentibus anni 1468 et anni 1469 ad papam (Paulum II) missa.

And as late as 1704 A. D. we find P. Ercole Corazzi arguing "against the fallacious and superstitious art of a certain astrologer who dares to predict and promise the promotion of cardinals":—Bologna University Library 963, ♯4.

Instances of Bonatti's detailed treatment.

We may not follow Bonatti through his long technical discussions of houses and exaltations of the planets, of *triplicitates* and *termini,* of why the naming of the signs of the zodiac begins at Aries and not at any other sign, or of what part of the body each planet signifies in each sign, and a hundred other similar questions. It must suffice to give a few suggestions of the thoroughness of his detailed treatment. The treatise on nativities promises to reveal everything which will "naturally"—a saving word for those who insist on freedom of the will—befall the child from birth to death, "and also what will be said of him after death." Pursuant of his promise, Guido considers such topics as length of life, physical and mental qualities, offices and property to be held by the person concerned, the fate of his brothers, parents, and children, serfs, and domestic animals, his sickness or health, mental afflictions, marriage, feuds, death, religion, learning, and journeys. The treatise on interrogations answers questions on all sorts of matters from winning crowns or gaining one's freedom to learning how many courses and what kind of food there will be at a dinner to which one has been invited and which one is in a quandary whether to accept or not. The treatise on elections selects favorable hours for any and every act of life from weaning and circumcising infants to trimming one's nails, hair, and beard. The treatise on revolutions descends from the fate of monarchs and nations during the year in question to such matters as the prospects for a good crop of melons or cucumbers.

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[1] Canon. Misc. 46, fols. 68-79, Regulae ad sciendum de diversis ad aegrotantes spectantibus secundum Guidonem Bonatum aliosque; fols. 51-61, Nicolai de Aquila, ord. Praed., tractatus in Astronomia qui medicinalis scientiae compendium nuncupatur, praevia ad Jo. de Olegio de Vicecomitibus de Mediolano praefatione.

The planet Jupiter.

Some further idea of Bonatti's method and content may be derived from the following translation of his account of the properties, significations, and effects of the planet Jupiter.

> "Alchabitius has said that Jupiter is fortunate, masculine, diurnal; and is by nature significant of property, since property is the second accident that happens to the child after birth . . . and Jupiter is second in the order of the planets. Jupiter is likewise the second planet to exert its influence on the child before birth, giving it spirit and life. And its nature produces heat and moisture, and is temperate, aerial, and sanguine. Of man's age Jupiter signifies the period called *iuventus* from youth to the prime of life, namely, from fourteen or twenty-one to forty or forty-five years. It governs those offices pertaining to law and just and honest judgments. And it attends when it sees any persons engaged in altercation or litigation, and makes peace between them and bestows harmony upon them, and ever is engaged in good pursuits. And it signifies abundant property. And such business occupations as are performed without deceit.
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> "It signifies spirit, life, joy, religion, truth, patience, and every precept that is good, lovely, and precious, and everything that is honorable. It indicates abundant charm. Of infirmities it signifies those due to excess of blood. . . . It is the planet of wisdom, of intellect, of sound practice. Moreover, if Jupiter be well disposed and in the east and at a favorable angle, the child will be of good quality, benign, just; he will honor the aged, and will be a good counselor, a helper of the needy, and of good repute. He will cherish his friends; he will be of good intellect.

> "But if Jupiter shall be unfavorable, Ptolemy is witness that the child will be ignorant of well doing, versed in diabolical practices, that he will intrigue under a hypocritical exterior, will linger in places of prayer, will gladly live in crypts and caverns and caves, and there will predict the future. He will love no one, though he may have a few friends; he will abhor his children, will shun human conversation, will seek no honors from anyone, will be untrustworthy, and no one can depend on him. In fine, he will be bad, weak, stupid, weary and heavy-laden, of evil election."

Having thus considered the properties of Jupiter *per se,* Bonatti next proceeds to record its tendencies when in conjunction with Saturn and the other planets.

An astrological image.

One of the stories told of Bonatti may be noted in conclusion, since it concerns an astrological image. Pitying a poor apothecary with whom he used to play chess, Guido gave him a wax image of a ship, telling him to keep it hid in a box in a secret place and he would grow rich, but that if he removed it, he would grow poor again. True enough, the man became wealthy, but then began to fear lest the image be the work of witchcraft. So, having made his fortune, he decided to save his soul and confessed concerning the image to a priest who bade him destroy it. But then, as Bonatti had predicted, he rapidly lost his entire fortune. He then begged Guido to make him another image, but Bonatti cursed him and told him that the image had been no magic one but had derived its virtue from constellations which would not recur for another fifty years.[1]

The geomancy of Bartholomew of Parma.

If the *Liber astronomicus* of Guido Bonatti was the leading Latin work on astrology in the thirteenth century, probably the most elaborate treatise in the associated art of geomancy was that by another Italian, Bartholomew of

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[1] Muratori, *Rerum Italicarum Scriptores,* revised edition, Fasc. 20, 1903, p. 105.

Parma, who appears to have written a long *Summa* [1] on the subject in 1288 in Bologna at the request of Theodosius de Flisco, bishop-elect of Reggio in northern Italy; [2] and then in October, 1294, a briefer treatment for two German friends and disciples named John and Paul,[3] and again in November, 1295, another abbreviated treatment for the beginner.[4] Titles in manuscripts at Vienna indicate that Bartholomew also wrote astrological treatises, [5] but perhaps they would prove to be merely extracts from his longer work on geomancy, although Houzeau and Lancaster give the date of a *Liber de occultis* by him as 1280.[1] None of Bartholomew's works seems to have been printed. The interest of the canon of Laon and bishop elect of Reggio in the art of geomancy is another of numerous indications that we have had that such occult and superstitious arts were at least not consistently condemned by the church and clergy.

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[1] Digby 134, 15th century, 128 fols. in an Italian hand, "Ars Geomantie que docet hominem solvere omnes questiones de quibus vult certificari divina virtute per istam artem . . . / . . . Compositus quidem est iste presens liber a magistro Bartholomeo de Parma in Bononia ad preces domini Tedesii de Flisco, qui erat tunc ellectus in episcopum civitatis Regii, curentibus annis Domini MCCLXXXVIII."

See also CLM 436, 16th century, fol. 46-.

Vienna 5523, 15-16th century, 208 fols.

Emmanuel 70, 15th century, fol. 80-, gives the date as 1286 instead of 1288; "Inc. breviloquium mag. bartholomei nacione parmensis bononie compilatum et confirmatum per prudentes viros de fructis tocius astronomie ad preces domini Thedesii de fusco anno 1286."

[2] Between 1283 and 1290 the bishopric of Reggio was vacant owing to a disputed election between Franciscus de Fullano, a canon of Reggio, and this Theodosius, who was a canon of Laon (Eubel, p. 439).

[3] CLM 489, 16th century, fol. 61, "Incipit breviloquium artis Geomantiae noviter compilatae a mgro Batholomeo de Parma, quod breviloquium extraxit de summa eius artis quam compilavit anno 1288 ad partes (preces) nobilis viri Theoderici de flisco. Et sic complevisse fatetur utrumque opus fideliter et verius quam scivit utilia scribens et superflua relinquens in hoc opusculo ad preces duorum suorum amicorum et discipulorum Johannes et Paulus Theutonicorum sub Anno Domini 1494 (1294) de mense Octobris in Bononia."

Magliabech. XX, 13, 15th century, fols. 1-60, "Incomincia il libro dell' arte della geomançia nuovamente compilato da maestro Bartholomeo da Parma a contemplatione de' suoi scholari da Bologna anno Domini MCCLXXXXIIII."

See also CLM 196, 15-16th century, fols. 1-10.

CLM 240, 15th century.

CLM 398, fol. 1-.

CLM 192, 1544 A.D., fol. 3.

[4] CLM 489, fol. 1r-, "Incipit Prologus Libri Geomantiae editi a mro Bartholomeo Parmensi Astrologo. Erba collecta de libro magno Geomantiae quae introducunt novum discipulum ut sciat sufficienter principia eiusdem artis per quae poterit cognoscere tot et tanta de arte Geomantia quod per se sciat universales regulas artis doctrinae ac questiones quaerentium generales iudicare absque errore si Deus voluerit. Hoc quidem opus est Bartholomaei astrologi Natione Parmensis Compilatum Anno Domini MCCLXXXXV Mense Novembris Sole existente in primo gradu Sagittarii."

Also contained in CLM 192, 240, and 398.

[5] Vienna 3124, 15th century, fol. 198, "Liber de occultis. Secreta scientia philosophorum est . . . / . . . et pauce utilitatis"; fol. 199, "e libro de iudiciis astrologiae loci"; fol. 202, "Significationes planetarum de libro consiliorum. Saturnus dicitur de antiquis deus

How to proceed in geomancy.

Bartholomew of Parma tells us that the art of geomancy originated from God and was taught to the sons of Noah by an angel who took on human form before the time of the flood. Whoever intends to practice that art should be "a friend of God" and a good man of praiseworthy life. No one should make use of it without real necessity of knowing the future and geomancers should beware of persons who try to catch them in error by asking questions about sure things. On the other hand, in certain cases one may ask questions for another person, and even without his knowledge, and questions may be put at any time and place, for the art of geomancy is simple and easy of operation. The only instrument needed is something to make a series of points or marks with. These dots should be set down in four rows like the four fingers of a hand, but at random without noting how many dots one puts in each row or how long the row is.[2] These four rows indicate the elements, points of the compass, and so on. Next one cancels the points in each line, cancelling two at a time until only one or two points remain in each line. When this is done we have one of the following sixteen possible geomantic figures, which I have indicated numerically rather than graphically: 2121, 2212, 1211, 1222, 2111, 2222, 2112, 2211, 1212,

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. . . / . . . Item significat Lavatrices panni petisequas ruffianas monachas," etc.

Vienna 5438, 15th century, fols. 116v-128r, Judicium particulare de mutationibus aeris. "In coniunctione solis et lune considera . . . / . . . sibi perhibet per naturam."

[1] Houzeau et Lancaster, *Bibliographie générale de l'astronomie*, Brussels, 1887. They ascribe other astrological works to him.

[2] "ad fortunam Dei sine certo numero et sine certa mensura longitudinis linearum."

2122, 1121, 2221, 1112, 1111, 1221, 1122. Of these the first eight are favorable, the last eight are unfavorable. They bear such names as gain, white, childhood, joy, head (*acquisitio, albus, pueritia, laetitia, caput*). The first inventors of the art are supposed to have worked out these figures "with great ingenuity and subtlety" from careful observations of the stars and of the virtues of the sky. Hence these figures have the property of signifying much concerning the future. Each is associated with some particular sign of the zodiac and with one of the planets. Also with a day, month, color, odor, taste, stone, tree, metal, and human type.[1]

Questions answered by geomancy.

Among the questions which geomancy undertakes to answer are how long one will live, whether one will better one's present position, whether one should enter the clergy or remain a layman, whether a journey will be dangerous, whether a rumor is true or false, whether to buy or not, whether the year will be a fertile one, and concerning gain and loss, hidden treasure, the condition of a city or castle, and which side is stronger in a war. Whether a child will be born or not, of what sex it will be, and whether it is legitimate or a bastard. Which of two magistrates is superior in wisdom, whether a scholar can by study become an honor to the convent or not, whether the soul of some dead person is in paradise or before the doors of paradise or in purgatory or in hell. In answering such questions the figure found by chance from the points is compared with and related to figures appropriate to the person inquiring and the thing sought, and a decision is rendered according as enmity or friendship is found to exist between them. In determining this the figures are reduced to terms of the twelve signs of the zodiac, and the astrological aspects are thus investigated.

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[1] Thus in the *Geomancy* ascribed to Michael Scot, from which I happen to have notes on this point rather than from Bartholomew's work, *Acquisitio* signifies a man of medium size, of handsome form, somewhat tall, with pleasing eyes, delicate nostrils, a graceful forehead, a subtle mind, a long neck, abundant hair, with his two front teeth larger than the others; a man of luxurious tastes and fond of money and ambitious for honor and power, kindly and loyal and giving many good things to others.

APPENDIX I

SOME MANUSCRIPTS OF THE LIBER ASTRONOMICUS OF GUIDO BONATTI

Boncompagni states that there are several MSS in the Bibliothèque Nationale at Paris and the following are noted in the old catalogue: of the 14th century, BN 7326 and 7327: of the 15th century BN 7328, 7329 (a fragment), 7441 (defective), 7442 (containing only the treatises on elections and revolutions), 7443 (only the treatise *De imbribus et aeris mutationibus*). Perhaps the following also has reference to Bonatti: BN 7316, 15th century, #20 (and last item), *Guidonis Bonafors liber abbreviatus per Fratrem Hugolinum de Faventia ordinis sancti Augustini qui ea tantum excerpsit quae ad astrologiam judiciariam pertinebant.*

Some MSS in English libraries are:

Arundel 66, 15th century, fols. 48-249, membr. folio maximo, a *de luxe* MS made for the use of Henry VII, whose portrait occurs at fol. 201.

Additional 26768, 15th century.

Savile 15 (Bernard 6561), a large MS in which it is the last treatise.

Peterhouse 86, 15th century. Here we have the *Liber introductorius* in two parts, then come Nativities, Revolutions, Conjunctions, the 146 considerations, weather prediction, *De partibus,* and finally *tractatus principalis de electionibus.*

CU Trinity 1418, 15th century, contains portions of Bonatti's work (James III, 445).

Other MSS are:

Vienna 2359, 14th century, fols. 1-38, *Guido Bonactus de Foro Livii, Liber introductorius ad iudicia stellarum:* fols. 39-50, *Considerationes super iudiciis . . .*; fols. 51-52, *Introductorium sub breviloquio ad iudicia stellarum;* fols. 53-92, *Explicit tractatus* *interrogationum seu questionum;* fols. 93-119, *Tractatus de electionibus secundum dicta sapientum;* fol. 120v, *Tabula magnitudinis et parvitatis diei;* fols. 121-61, *Tractatus super nativitatibus;* fols. 162-6, *De imbribus et de aeris mutationibus;* fols. 167-200, *De revolutione annorum et mundi;* fols. 201-210, *Tractatus proiectionum quarumlibet partium.*

Vienna 3124, 15th century, some scattered parts from it.

Wolfenbüttel 2734, 14-15th century, in several hands, *Liber introductorius ad iudicia stellarum . . . editus a Guidone Bonacco de Forlivio. . . .*

Amplon. Folio 381.

CLM 59, 15th century, contains some of its treatises.

Arsenal 1129, 15th century, fol. 207, *Liber astronomicus.*

Dukes of Burgundy 1462, 15th century, *Guidonis de Forlino, De judiciis astrorum, "Ex hiis autem ad judicia. . . ."*

Magliabech. XX, 14, 15th century, mutilated, ending at VIII, 18, in 129 fols. *Incipit liber introductorius ad iuditia stellarum. Et est non solum introductorius ad iuditia set est Iuditiorum astronomie. Editus a Guidone Bonatto de Forlivio. Et collegit in eo ex dictis philosophorum ea que visa sunt.*

Ravenna 356, 15th century, 6 fols. containing *De imbribus et de aeris mutationibus et que circa illa versantur.*

Vienna 3276, 14th century, fols. 275-80, *Die kunst augurium,* in German by *Guido Astronomus,* is perhaps an extract from Bonatti.

CHAPTER LXVIII

ARNALD OF VILLANOVA

Recent research into his life—His twofold importance—Narrative of his life—In theological difficulties—Events of 1305—The close of his life—Arnald and the Inquisition—His works—Attitude to natural science—Magic excluded from medicine—*Disapprobation of Sorcerers*—The devices of sorcerers—Counter-magic against them—Arnald's works and the Inquisition again—Incantations—Cures of old-wives—Ligatures and suspensions—Marvelous virtues in nature—Occult virtue defined—Due to the stars—Astrological medicine—Bleeding and the moon—Bernard Gordon's personal experience—Operative astrology or magic—Seals or images—Experimental method—Further foibles of Arnald's medicine—The affair of Bernard Délicieux.

Recent research into his life.

ARNALD of Villanova has been rather unusually fortunate among medieval men of learning in the accurate research which within the last fifty years scholars have made into the sources for the facts of his career. Before that time all sorts of assertions and dates were current concerning his life, although even then those who took the pains to turn back to Astruc,[1] could find in his work a tolerably correct account of Arnald's biography. But now we have a much fuller treatment of his life and works by Hauréau in the *Histoire Littéraire de la France*,[2] while the researches of Menéndez Pelayo [3] in the Vatican library and the crown archives of Aragon have brought to light new documents of importance. Subsequently Chabás has discovered an old and authentic copy of Arnald's last will and testament in the cathedral archives of Valencia.[1] Further materials bearing upon his career appeared in Finke's *Acta Aragonensia*,[2] and have been written up by Diepgen in a monograph on Arnald's political and theological activity after 1299.[3]

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[1] Jean Astruc, *Mémoires pour servir à l'histoire de la Faculté de Médecine de Montpellier*, Paris, 1767. A much cited book, but seemingly rare in this country.

[2] HL 28, 26-104, with corrections and additions based on Menéndez Pelayo's researches at pp. 487-90.

[3] Menéndez Pelayo, *Arnaldo de Villanova médico Catalán del siglo XIII*, Madrid, 1879; and *Historia de los heterodoxos españoles*, Madrid, 1880, I, 449-87, 720-81.

His twofold importance

Arnald's personality and career have long attracted attention, not only because of his prominence as a practicing physician and writer on medicine and alchemy, and because of his close relations with several kings and popes. He also is noted for his connection with ecclesiastical history, his relations with the Spiritual Franciscans and the theologians of Paris, and for his criticisms of existing conditions in the church of his time,—criticisms which he combined with Joachimite ideas of a speedy end of the world and coming of Antichrist. These points long ago caused his inclusion in Matthias Illyricus Flacius's *Catalogue of Witnesses to the Truth who before our time attacked the primacy of the Roman pontiffs and the various superstitions, errors, and impious frauds of Popery*,[4] and more recently in Menéndez Pelayo's *Historia de los heterodoxos españoles.* And it is true that Arnald composed a violent diatribe against the regular clergy of his day and also a *Sword of Truth against the Thomists.*[5]

Narrative of his life.

Arnald was a Catalan, although Pope Clement V speaks of him as "a clerk of Valencia." Arnald writes of his youth as a time of hardship and of himself as "a country practitioner" without literary culture. Yet he came to shine at courts and to defy synods of learned doctors of theology He also mentions his early education in a Dominican convent and his study of medicine at Naples under John Calamida. During his entire life he seems to have been continually moving about, and his works speak of observations and operations in many towns of Spain, Italy, and France. Some of his treatises were written in Valencia, others in Barcelona, others in Naples, or in Gascony, Piedmont, Bologna, Rome, and even Africa. He was often called abroad to render medical services to popes and other potentates and was frequently employed in foreign diplomacy by the kings of Aragon and Sicily. By 1285 he had won a sufficient reputation as a physician to be called from Barcelona to attend Peter III of Aragon in his last illness. Peter gave him a castle in Tarragona. After that Arnald seems to have taught at Montpellier which was then under the jurisdiction of Aragon. Three later bulls of Clement V in 1309 making regulations for the medical faculty at Montpellier mention Arnald of Villanova as one of the persons by whom the pope has been advised in the matter, and speak of him as having "once long ruled" in that university.[1] Astruc tells us that in the eighteenth century the house where he had lived was still shown in Montpellier, ornamented with sculptured figures which were interpreted as magic symbols.[2]

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[1] Roque Chabás, in *Boletín de la real Academia de la Historia*, vol. 28, p. 87. I have not seen this, but have used Leopold Delisle, *Testaments d'Arnaud de Villeneuve et de Raimond Lulle, 20 juillet 1305 et 26 avril 1313. Extrait du Journal des Savants*, June, 1896.

[2] H. Finke, *Acta Aragonensia*, vol. II (1291-1327), 1908.

[3] P. Diepgen, *Arnald von Villanova als Politiker und Laientheologe*, 1909, in *Abhandl. z. Mittl. u. Neuer. Gesch.*, Heft 9. Diepgen proposed to treat later of Arnald's medicine and investigate the genuineness of several works ascribed to him.

[4] *Catalogus testium veritatis qui ante nostram aetatem Pontificum Romanorum Primatui Variisque Papismi superstitionibus erroribus ac impiis fraudibus reclamarunt. Nova hac Editione emendatior*, etc., 1608.

[5] Vatican MS 3824, *Confessio . . . de spurcitiis pseudo-religiosorum. Eulogium de notitia verorum et pseudo-apostolorum. Gladius veritatis adversus thomistas.* And other anti-clerical or theological treatises.

In theological difficulties.

In 1292 Arnald composed a treatise on the significance of the holy name, *Tetragrammaton,* both in Hebrew and Latin, and on the declaration of the mystery of the Trinity. This and later essays of his in the field of religion were not well received by most theologians, who would have preferred that he confine his efforts to medicine. In 1299 Arnald was sent to Paris with a message from James II of Aragon to Philip the Fair. Here he was arrested by the inquisition, but was bailed out the next day, Nogaret being among those who stood security. Presently he was brought to trial before the bishop and the theological faculty of Paris for a work predicting the coming of Antichrist about the middle of the fourteenth century upon the basis of passages in Daniel and the Erythrean sibyl, and his book was ordered to be burned.[1] Arnald protested to the king of France and later to a crowd of distinguished people at the bishop's palace and appealed to Pope Boniface VIII. Finally he was allowed to leave France and in November, 1301, is found at Genoa.

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[1] The bulls are printed by M. Fournier, *Les Statuts et Privilèges des Universités Françaises,* II (1891), 21-3.

[2] Astruc (1767), p. 153

Arnald submitted to Boniface VIII a slightly modified version of his work on Antichrist, accompanied by a tone of pious self-abnegation and considerable shrewd flattery of the pope as "Christ on earth" and "God of gods." The theologians of Paris, however, had sent a portion of the original text to the pope with the result that Boniface kept Arnald in prison for a time and forced him to abjure his work in secret consistory, but finally said that Arnald had erred only in not submitting the work to him in the first place. After Arnald had treated Boniface successfully for the stone, that pontiff's estimation of him greatly improved, and he received favorably a new work which predicted the history of the Mediterranean world for the next century until the coming of Antichrist, bewailed the worldliness of the clergy, but upheld the papal power, to which, of course, Arnald looked to further the ecclesiastical reforms which he had at heart. Boniface also presented Arnald with a castle at Anagni, but the sun proved too hot there for Arnald's head. Early in 1302 he left the papal curia, in April he received permission from King James II to dispose of his property in Valencia. His writings on Antichrist and against certain of the clergy continued, and in February, 1304, he was at Marseilles complaining before the bishop of some Dominicans who had attacked his treatises. He then addressed himself to the new pope, Benedict XI, at Perugia, but was not well received, and complained that the pope had judged and punished him before hearing him. But Benedict's brief pontificate was soon over and Clement V showed himself more gracious.[1]

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[1] Diepgen (1909), 17-21. Denifle et Chatelain, *Chartularium Universitatis Parisiensis,* II, 86-90, give Arnald's letter notifying James II of Aragon of his detention at Paris, and his appeal to the pope, both dated in October, 1300.

Events of 1305.

Meanwhile in April, 1305, Arnald returned to Barcelona where he found James II sick abed and very glad to see him and to entrust himself to his medical care rather than that of Ermengard Blasius (or Blasii)[2] who had hitherto attended James. About this time Arnald seems to have interpreted a dream for James, but that monarch later repudiated Arnald's account of the affair and they were estranged for a time.[3] Arnald's will, drawn up on July 20, 1305, by a public notary of Barcelona, informs us concerning his library, other property, generosity to the poor, and reveals the fact that he had a wife and children.

The close of his life.

Arnald, however, still had several years of life before him. A declaration has been preserved which he made in 1306 concerning the observance of certain statutes at the University of Montpellier.[4] James II employed him in 1306-1307, and he corresponded with Clement V and Philip IV. In 1308-1309 he interpreted a dream for Frederick of Sicily and with him concocted a scheme for a crusade and reform of the church, in pursuance whereof he went to Rome, Barcelona, and Avignon, and carried letters back and forth between James and Frederick.[5] Arnald had been with Clement V at Bordeaux and seems to have been with him again at Avignon in 1309, but he does not appear to have been the pope's official physician,[1] although very probably he rendered him some medical service. About this time he also seems to have written several treatises in medicine and alchemy, including his *Preservation of Youth,* for King Robert at Naples. Raymond Lull speaks of meeting him there and acknowledges his debt to his friend Arnald for one of his "Experiments." A letter of December 6, 1311, from Escarrer at Naples to King James shows that Arnald died in the closing months of that year.[2] In 1312 we find Clement V advertising by public letter for a medical treatise by Arnald intended for his perusal but which the death of the author had prevented from reaching its destination.

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[1] In this paragraph I have followed Diepgen (1909), pp. 23-36, 44-46.

[2] Noted as a translator; see *Translatio Canticorum Avicennae cum commentario Averrois ex arabico in latinum,* Venetiis, 1492. This work was executed in 1283 according to Peterhouse 101, 13-14th century, II. In 1307 he translated the treatise on poisons of Moses Maimonides for Clement V at Barcelona; see Peterhouse 101, III, and Corpus Christi 125, fols. 1r-13v. Before that in 1302 he had translated at Montpellier another medical work of Maimonides, *De asinate;* see Gonville and Caius 178, 14-15th century, fols. 130-65. Steinschneider (1905), p. 6, speaks of "Armengab (oder Armengaud, nicht Armengand) Blasii, in Montpellier, Arzt Philipps des Schönen, gest. 1314 übs. aus dem Hebr." But Fabricius speaks of Armegandus or Ermengardus Blasii, and the aforesaid MSS give such forms as "dymengandus blasii," "a mag. hermengaldo blasii," "a mag. Armengando blazini," "a mag. Armegando blasii de monte pessulano magistro in medicina."

[3] Diepgen (1909), 83-88.

[4] Listed but not printed by Fournier, *Les Statuts et Privilèges des Universités Françaises,* II (1891).

[5] Diepgen (1909), 48-82.

Arnald and the Inquisition.

Already during Arnald's lifetime in 1305 the inquisitor of Valencia forbade the possession or reading of his books, a decree against which King James protested. Five years after Arnald's death the inquisitor and provost of the church at Tarragona declared some statements in Arnald's writings heretical, and Diepgen thinks that we have lost a number of his religious writings in Catalan in consequence;[3] but this sentence appears to have no more lessened his medical influence than his trial at Paris had prevented his having intimate relations with the popes.

His works.

One indication of Arnald's long continued influence in the learned world is that some seven so-called complete editions of his works were printed in the course of the sixteenth century.[4] Besides this, some of his writings were published separately or appeared in miscellaneous collections, and some were translated into the vernacular languages. Some, however, still remain in manuscript form. The majority of his writings are medical, such as the *Mirror of Medical Introductions, Breviary of Practice, Rule of Health, General Rules for the Cure of Disease, Commentary on the Regimen Salernitanum, Collection of Antidotes,* and special treatises on the stone, gout, and epilepsy. But besides the works of alchemy ascribed to him there are other treatises on themes of especial interest to us, the *Disapprobation of Sorcerers* (*Libellus de improbatione maleficiorum*), *Remedies against Sorcery, Judgments of Infirmities by the Motion of the Planets,* and the treatise on *Seals* or astrological images. Although Arnald interpreted dreams for kings, the treatise on interpretation of dreams which is printed with his works is in the manuscripts either anonymous or ascribed to William of Aragon. Some of these other works too are perhaps not by him, but similar themes are occasionally touched upon in his more purely medical works. In the printed editions of his works is found a Latin translation of the treatise of Costa ben Luca *On physical ligatures,* which we have already discussed, and it is not unlikely that some of the aforesaid works are translations from the Arabic and not original compositions by Arnald. Some of his medical writings seem little more than repetitions of Galen, whose works he cites a great deal.

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[1] One of the above-mentioned papal bulls of 1309 speaks of "our cherished sons, masters William of Brixia and John of Alesto, our physicians and chaplains, and also of Master Arnald of Villanova, physician"; while the other two bulls speak of "our cherished sons, Arnald of Villanova and John of Alesto, our physician and chaplain." Thus William and John, rather than Arnald, seem to be the pope's private physicians.

[2] Diepgen (1909), p. 94.

[3] *Ibid.*, p. 99.

[4] They will be found listed in HL 28, 50-51. I have used the edition published at Lyons, in 1532.

His attitude to natural science.

In one of his medical works Arnald states that the parables of Solomon show that what learned men have revealed in the world of nature can be adapted by convenient metaphor to moral instruction. But from this one should not jump to the conclusion that he thought that the chief use of natural science was to point a moral. On the contrary in almost the next sentence we find him affirming that "all true knowledge arises from the senses" and that the education of youth should begin with this sense knowledge, "graciously and efficiently demonstrated." Thus Arnald would assign to natural science a leading place in education. As the mind went over this material, he thinks that it would reach many abstract conclusions, and could gradually attain "to the knowledge of insensible and occult and arduous and subtle things, as is illustrated by the whole course of theology and by the whole course of medicine." [1]

Magic excluded from medicine.

There are passages in Arnald's works where, like Pliny, Galen, and other writers since them, he professes to exclude everything savoring of magic and superstition from his medicine. For instance, in his chapter on *Those things whose use is permitted in the cure of epilepsy*, a disease into whose treatment we have seen that magic is especially liable to enter, he would "repel the ignominious" enchanters, conjurers, and invokers of spirits, diviners and augurs, from the field of medicine as a godless crew who are servants of the devil. He cites the church fathers to show that all pagan divination is by demon aid. In the same chapter he disapproves of any use of "characters and superstitions" in medicine, and even forbids the use of the sign of the cross or Lord's Prayer in collecting medicinal simples.[2]

Disapprobation of Sorcerers.

In his *Libellus de improbatione maleficiorum* [3] Arnald questions the power of sorcerers or necromancers to invoke demons and compel them to give responses or to work wonders. By adopting a very similar argumentation to that of the early fathers he arrives at the familiar theological conclusion that men are purposely misled in these arts of sorcery and necromancy by the demons who have invented the fiction of an art and a procedure to cover their own iniquitous ends. Arnald is not concerned to emphasize this conclusion especially, however; his object is rather simply to show that demons cannot naturally be compelled by man to obey him. He argues that the human mind, which is joined to a body, is of inferior grade to separate or incorporeal substances and so cannot command them. He also holds that demons who are spiritual beings cannot be coerced by human use of natural objects such as gems or even by human use of the influence of the stars. He denies that demons are distributed in any particular quarters of the heavens, or that they are subject to man at any particular hours of the day. He denies that spirits can be coerced by the light of the celestial bodies, asking, if this is so, why they are invoked at night and in darkness rather than at midday. He admits that it is the opinion of many that a spirit can be coerced by the special virtue of Saturn or of Jupiter or some other star; but he questions whether man can master this special virtue of a planet, "since no terrestrial substance naturally governs a star, although some philosophers have said that the human soul sometimes commands the nature of the elements." He also raises the familiar objection that the invokers of spirits are usually inferior to other men in virtue and intelligence, whereas those who lead pure and rational lives should by rights be the ones to control the influence of the stars, if any men can. Arnald further denies that artificial figures and characters or words uttered by man can overpower demons, since these artificial products derive such virtues as they have from things of inferior nature or the stars or the human artificer, and he has already insisted that none of these can coerce spirits. He justly observes that to contend that necromancers can control the demons through superior demons is "stupidly said" and begs the question. He therefore concludes that God alone can control the evil spirits and that He would delegate His power, if at all, only to saintly men and not to such wicked sinners as the invokers of demons are. The *Histoire Littéraire de la France,* in its brief account of this treatise, says, "It goes without saying that Arnald does not think all sorceries purely imaginary; however, it should be stated that he tries to demonstrate that demons are less at the beck and call of sorcerers than is commonly thought, and that many so-called instances of sorcery are merely pathological cases." This last has reference to the close of the treatise where Arnald makes the commonplace medieval observation that persons suffering from melancholy are to be humored in their delusions.

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[1] *Regule Generales Curationis Morborum, Doctrina VI.* "Cum omnis vera cognitio a sensu oriatur et ab his quae sensibilia sunt habeat ortum, necessario ipsa sensibilia debent gratiose et efficaciter demonstrari iuvenibus et adiscentibus, cum tunc intellectus discurrens per ea abstrahit multa media et multas conclusiones. Unde per sensibilia venit intellectus ad cognitionem insensibilium et occultorum et arduorum et subtilium, ut declaratur per totum processum theologiae et per totum processum medicinae."

[2] *De epilepsia*, cap. 25. A similar passage in a work contemporary with Arnald, Bernard Gordon's *Tractatus de decem ingeniis curandorum morborum*, pp. 228-9 of the Venice, 1496, edition, reads: "Tertio quod medicus operatur secundum artem seu per canones Galenis et Hippocratis et aliorum sapientium et in hoc condemnatur omnis ars augurandi sicut est ars geomantica et suspendendi herbas ad collum et omnia emperica et forticinia et fassina et alia quam plurima quae non est bonum revelare propter abutentes qui conscientia neglecta utuntur magis et quibusdam ingeniis fatuis et cum omni sollertia pessima et mala lege et multa similia quae non sunt tunc narrabilia. . . . Et testor deum et nimirum quod numquam vidi hominem malitiosum in medicina qui diu duraret dies suos."

[3] Also rather inappropriately entitled in the MSS (BN 6971, fol. 65; 7337, fol. 110; 17847, fol. 53), *Quaestio de possibilitate et veritate imaginum astronomicarum.* The treatise is addressed to "Reverendissimo patri et non ficte bonitatis exemplo dei provisione presuli valentino. . . ."

I have somewhat altered the order of Arnald's arguments in order to make them more comprehensible and readable.

The devices of sorcerers.

That Arnald did not regard all sorceries as purely imaginary is further indicated by the long list of remedies against them collected in his *Remedia contra maleficia.* All but one or two of the suggestions made by Petrus Hispanus in the chapter on counteracting witchcraft and dispelling demons in the *Thesaurus pauperum* are found again in Arnald's treatise. He also adds others and prefaces his list of cures by a description of the devices employed by sorcerers to impede conjugal relations. The sorcerer usually secretes in the mattress or pillow of the nuptial bed such objects as the two halves of an acorn, granulated beans, written characters, the filth of a bat, or the testicles of a live cock. Arnald recommends that such articles be searched for and removed, or preferably taken to a priest; or that the couple sleep in another bed or house.

Counter-magic against them.

In the case of the divided acorn he more explicitly recognizes the validity of the sorcerer's sympathetic magic by prescribing an equally magical counter-ceremony. The husband and wife are each to take one-half of the nut and place the two halves together, and, after an interval of six days, eat them. Apparently Arnald believes that humans can be bewitched by use of natural substances and written characters, although in the other treatise he denied that demons could be so invoked. But now he goes farther and lists natural antidotes and preventives against demons as well as sorcery. Thus keeping the heart of a vulture or certain herbs in the house is said to cause demons to flee, although we have heard him deny that demons can be attracted by natural substances. Less surprising is the use of the sign of the cross, of holy water, masses, and the writing of the Tetragrammaton and other names. Interesting rites for the protection of newly married couples against witchcraft of unknown origin are suffumigations of the nuptial chamber with the gall of a certain fish, or the leaves and fruit of a bramble bush, or the pulverized tooth of a dead man.[1]

Arnald's works and the Inquisition again.

The *Histoire Littéraire de la France,* remarking that this treatise by Arnald was forbidden later by the Spanish Inquisition, adds, "No one will hold that decision against them" (*On ne leur reprochera pas cette décision*). But one wonders if the Inquisition also condemned the *Thesaurus pauperum* of Pope John XXI, which we have seen contained many of the same remedies against witchcraft. Only another proof that censors never know what is in the books that they condemn! But perhaps the medieval or papal inquisition would not have made such a slip. Certainly the Spanish Inquisition had grown very captious, if, as the *Histoire Littéraire* says, it also forbade Arnald's treatise on astrological medicine and some alchemistic works ascribed to him.

Incantations.

Arnald's attitude in the matter of incantations is as inconsistent as his position regarding the effect of natural substances on spirits. In one passage of his *Breviarium* [2] he condemns the incantations employed in cases of childbirth by the old-wives of Salerno. Taking three grains of pepper, the enchantress would say over each a Lord's prayer, substituting for the words, "Deliver us from evil," the request, "Deliver this woman from the pangs of childbirth." Then she would administer the grains one after another in wine or water so that they should not touch the patient's teeth, and finally she would repeat thrice in the patient's ear this incantation, accompanied each time by a *Paternoster,*

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[1] Of these the first two are not given in the *Thesaurus pauperum.*
[2] *Breviarium,* III, 4.

Bizomie lamion lamium azerai vachina deus deus sabaoth,
Benedictus qui venit in nomine domini, osanna in excelsis.

Arnald declares that such diabolical practices should be shunned by all the faithful. Yet in the same treatise [1] he tells of an almost identical procedure by which a priest cured him of over a hundred warts within ten days. The priest touched the warts, made the sign of the cross, turned to a parietary and kneeling repeated the Lord's prayer, substituting for the words, "Deliver us from evil," the request, "Deliver Master Arnald from the wens and warts on his hands." After which, instead of the three peppercorns he plucked the tips of three of the stalks of the parietary, at the same time repeating three *Paternosters,* and placed those three tips in the ground in a damp and secluded spot. "And," concludes Arnald, "when they began to wither, my warts began to disappear." It is true that the couplet of jargon, which perhaps Arnald regarded as alone diabolical, is omitted and that a priest rather than a witch performed the rite, but the Lord's prayer is still used as an incantation and the ceremony with the stalks is a clear case of magic transfer of disease and of sympathetic magic. In a third passage of the same treatise [2] Arnald suggests the following "good prayer" against quinsy, "Lord Jesus Christ, truly our God, by the power of thy name Jesus and by the prayer of thy servant Blasius,[3] deign to free A. thy servant." The popularity of *The Breviary of Practice from head to soles of feet,* in which these passages occur is indicated by the fact that it had been printed three times during the later fifteenth century before any complete edition of Arnald's works had been published.[1]

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[1] *Breviarium,* II, 45.

[2] *Ibid.,* II, 1. Possibly this particular passage is a later gloss, as it is marked *Additiones,* but HL 28, 62-3, regards it as Arnald's, and marvels that a man of his zeal for science and truth should believe in the efficacy of such procedure.

[3] Presumably Ermengard Blasius, mentioned above, and his colleague at Montpellier.

Cures of old-wives.

Arnald does not always speak ill of the cures of the old-wives. At Rome he saw a poor woman cure quinsy sore-throat with a plaster of her own,[2] and at Montpellier a good wife cured by some secret method a man who was threatened with death by a continuous hemorrhage.[3]

Ligatures and suspensions.

It was not inappropriate that Arnald should have translated the treatise of Costa ben Luca on *Incantations, Adjurations, and Suspension from the Neck,* or that at least that treatise should appear among his works, in view of the specimens of prayers and formulae which we have just given and of the more numerous instances of ligatures and suspensions in his works which we shall next illustrate. In his *De parte operativa* he says that there are plants, stones, and parts of animals which, if suspended about the neck or bound about the body or sewn into the clothing, produce impotency, a belief which his *Remedia contra maleficia* have already illustrated. In his treatise on wines he states that coral suspended from the neck so that it touches the abdomen prevents disturbances of the stomach. In his work on epilepsy[4] among other suspensions he mentions some which he has tried with boys, the wood of certain trees bound with silver. Kings are taught to suspend an emerald about their children's necks as soon as they are born as a protection against epilepsy, or the gem may be worn in a ring as an amulet against that disease. "Socrates recites this marvelous experience," of the two stones found in swallows' gizzards and how one may be worn in skin as an amulet. In his *Treatment for Gout* Arnald tells how

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[1] *Breviarium practicae a capite usque ad plantam pedis, cum capitulo generali de urinis et tractatu de omnibus febribus, peste, empiala et liparia,* Milan, 1483; Venice, 1494 and 1497.

[2] *Compend. medic. pract.* II, 1; cited HL 28, 43.

[3] *Breviarium,* I, 38; cited HL 28, 34.

[4] *De epilepsia,* caps. 24 and 4.

"some experimenters" bind a frog's legs on the patient's feet, right foot on right, and left on left; while "another philosopher and experimenter" binds on the stone magnet, and still others use the talon of an eagle or the foot of a tortoise.

Marvelous virtues in nature.

As these ligatures and suspensions suggest, Arnald was a believer in marvelous virtues in stones, plants, animals, and human beings, and he discusses the general subject of occult virtue at some length. He accepts the notion that the magnet cannot attract iron in the presence of adamant.[1] A way to discover whether an epileptic has been cured is to make him inhale smoke from burning horn of goat or pulverized agate; if not perfectly cured, he will straightway fall in a fit.[2] Fumigation of a villa or manor with a cow's left horn keeps away locusts.[3] Arnald enlarges upon the great virtue of wine in which a heated gold plate has been extinguished four or five times. Some persons merely hold a gold-piece in the mouth while drinking wine, but Arnald deems it wiser to reduce the gold to potable form, although he admits that there may be some efficacy in the other method, since merely holding silver in the mouth quenches thirst and holding coral in the mouth comforts the stomach.[4]

Occult virtue defined.

In the eighteenth chapter of his *Mirror of Introductions to Medicine* Arnald defines occult virtue or *proprietas,* as he also calls it. Briefly it is a property which is not immediately perceptible to the senses as are heat and cold, color, odor, and taste, and also one for which reason cannot account and whose existence cannot be learned by reasoned experiment but only by chance discovery. This is because such occult virtue depends on two things: the mixture of the elements in the object possessing it and its "specific form." But the ratio of components in compounds "varies infinitely" and cannot be learned by reason, and the same is true of their "specific forms." Nor can they be discovered by rational experiment which requires some objective to aim at. Therefore the only way to discover the occult virtue of an object is to happen upon its manifestation by chance. Again in his *Repetitio super Canon 'Vita Brevis'* [1] Arnald declares that "properties" cannot be learned by reason but only by experience or revelation.

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[1] *De parte operativa,* fol. 127.

[2] *Breviarium,* I, 22.

[3] *De venenis.*

[4] *De vinis,* fol. 263v.

Due to the stars.

Such occult virtue, or at least the "specific form" upon which it partly depends, is ascribed by Arnald as usual to the influence of the stars. It is owing, for example, to "the specific influence of the heavens" that gold is "something arcane, most perfect in its equable temperament, composed of a marvelous proportion of the virtues of the elements, and which has not its like among compounds." [2] The gold made by alchemists may resemble it in color and substance but not in this occult virtue. Arnald, indeed, holds what Aquinas and others denied, that different individuals of the same species may be endowed by the stars with diverse properties.[3] This is in his opinion the explanation why one sapphire will harm and another cleanse the human eye. "It leaps into the eye and is received in its bosom without injury and comes out loaded with foreign matter."

Astrological medicine.

From the occult virtue of terrestrial objects we are thus led as usual to the superior influence of the stars, which occupies a prominent, or better, fundamental place in Arnald's works. He affirms that "since it is evident that God, the supreme artificer and begetter, has committed the government of nature to the motions of the stars, their influence upon the human body is no slight one." [4] Or he cites Galen as saying that philosophers assert that all things on earth are formed and fulfilled by the course and working of the heavenly bodies.[5] The hour of collecting medicines is often very important [6] and the physician should also know how the air about us is altered by the stars.[7] Astrological medicine is also found in Arnald's treatise on preserving youth and retarding age,[1] and in his *Judgments of Infirmities by the Motion of the Planets,* where he also associates the members of the human body with the signs of the zodiac. This he does for the seven planets in his treatise on epilepsy.[2]

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[1] Fol. 276.

[2] *De vinis*, fol. 263v.

[3] *De parte operativa*, fol. 127; *Antidotarium*, cap. 2.

[4] *De epilepsia*, cap. 1.

[5] *Regulae generales curationis morborum, Doctrina iv.*

[6] *Antidotarium*, cap. 3.

[7] *Medicinalium Introductionum Speculum*, cap. 13

Bleeding and the moon.

Arnald alludes a number of times to the practice of bleeding according to the phases of the moon. In his *Regulation of Health* he discusses how the age of the moon and its location, conjunctions, and aspects must be taken into account.[3] In his *General Rules for the Cure of Disease*[4] he says that the influence of the moon should be regarded by physicians in their pharmacy as well as their blood-letting, as anyone who operates long and intelligently will find by experience. Astrological authors prove it, but medical authors generally remain silent on this point. Arnald finds support, however, in Galen's *Critical Days* and other works, and in the more recent works of Gilbert of England, who cautions to observe the moon in bleeding and advises against blood-letting in dog-days or on Egyptian days. Arnald would also include cauterization, other surgical operations, and the administration of drugs, and there is much observance of dog-days in his *Treatise against the stone.* On the other hand, Arnald rejects as false and worthless the statement in the *Regimen Salernitanum* that the months of April, May, and September are lunar and that in them are the days on which bleeding is prohibited.

Bernard Gordon's personal experience.

Bernard Gordon, a medical contemporary of Arnald, notes in his *Phlebotomy,* written in 1307, that wise astronomers agree that bleeding should not be practiced when the moon is in Gemini, because at that time the vein will not give blood or it will open again or the patient will die. He goes on to narrate, however, that once having made all preparations to bleed himself, it suddenly occurred to him that the moon was then in Gemini. He persisted with the operation, however, which would seem to indicate that he did not really believe that it would prove disastrous; and he records that as a matter of fact that particular bleeding did him more good than any other one he ever underwent. Yet as the *Histoire Littéraire* notes,[1] he reproduced the opinion of the astronomers without comment in his *Prognostications.* Which suggests that clergy who practiced in private arts of divination which they condemned in their writings were not the only ones whose preaching and practice might be divergent; Bernard defies astrological medicine successfully in personal practice but he continues to preach it in his writings. But to return to Arnald.

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[1] *De conservanda iuventute et retardanda senectute.*

[2] *De epilepsia,* cap. 1.

[3] *De regimine sanitatis,* cap. 37, fol. 78v.

[4] *Doctrina iv.*

Operative astrology or magic.

Arnald believes that a human operator can accomplish great things by availing himself of the influences of the stars, an idea which he develops especially in the treatise entitled, *De parte operativa.* In the first place, there is the negative consideration that the force which pours forth unceasingly from the stars is not absorbed unless bodies are in a condition to receive it, and that they may be put into such a favorable condition by art as well as by nature. More positively, everything produced by art or nature receives from the sky some property of acting upon other bodies or of being acted upon by them. So any man who knows the influences of the stars and how to prepare objects to receive them, can produce great and marvelous changes in inferior things. Arnald thinks that "the juggleries of the magicians and the illusions of the enchanters" and the operations of sorcerers and those who fascinate, have efficacy in no other way, except of course as demons may lend their aid. In other words, astrology is the basis of magic.

Seals or images.

Arnald speaks particularly of gems to which either Nature, the marvel-worker, or some erudite artist has given efficacious powers by engraving them with images in accordance with the constellations.[2] In his medical works he states that a lion on a lead seal prevents one from feeling pain in an operation for the stone,[3] and that an image of a

[1] HL, 25, 330.

[2] *De parte operativa,* fol. 127.

[3] *Antidotarium,* cap. 3.

man holding a dead serpent in his right hand and its tail in his left hand is an antidote for poison.[1] That Arnald also employed such methods in actual medical practice is shown from the fact that Pope Boniface VIII set great store by a seal in the form of a lion which Arnald had prepared for him when he was suffering from the stone.[2] Arnald's separate treatise on seals gives detailed directions for engraving one for each sign of the zodiac. The following example is typical of the others and also further illustrates Arnald's propensity to pious incantations: "In the name of the living Father of our Lord Jesus Christ, take the purest gold and melt it as the sun enters Aries. Later form a round seal from it and say while so doing, 'Arise, Jesus, light of the world, thou who art in truth the lamb that taketh away the sins of the world and enlighteneth our darkness.' And repeat the Psalm, *Domine dominus noster.* After doing this much, put the seal away, and later, when the moon is in Cancer or Leo and while the sun is in Aries, engrave on one side the figure of a ram and on the circumference *arahel tribus juda v et vii,* and elsewhere on the circumference let these sacred words be engraved, 'The Word was made flesh and dwelt among us,' and in the center, 'Alpha and Omega and Saint Peter.'" These instructions are perhaps some relic of gnosticism. Arnald then states the virtues and powers of the seal: "Moreover, this precious seal works against all demons and capital enemies and against witchcraft, and is efficacious in winning gain and favor, and aids in all dangers and financial difficulties (*vectigalibus*), and against thunderbolts and storms and inundations, and against the force of the winds and the pestilences of the air. Its bearer is honored and feared in all his affairs. No harm can befall the building or occupants of the house where it is. It benefits demoniacs, those suffering from inflammation of the brain, maniacs, quinsy sore throat, and all diseases of the head and eyes, and those in which rheum descends from the head. And in general I say that it wards off all evils and confers goods; and let its bearer abstain as far as possible from impurity and luxury and other mortal sins, and let him wear it on his head with reverence and honor."

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[1] *Antidotarium,* cap. 3.

[2] Diepgen (1909), p. 25.

Experimental method.

Arnald's pages have supplied some evidence of the continued vogue of that "experimental knowledge" and "experimental science" of which Albertus Magnus and Roger Bacon and others of the early thirteenth century wrote. In a passage not yet noted [1] Arnald recognizes the difficulty of medical experimentation and, like Petrus Hispanus and John of St. Amand, makes some suggestions as to how it should be conducted. They are, however, not novel. We have also heard him speak of experimenters, of a "philosopher and experimenter," of "the long experience of any intelligent operator, and of "rational experiment" which "always presupposes a determined object." We have also heard him admit that the occult virtues of natural objects can be hit upon only by chance experiment or by some sort of revelation. And since these last two channels are as open to the common people as to the learned, it is possible that knowledge of occult virtues should be attained sooner by uneducated men than by others.[2] This is not necessarily the case, however, and in a third treatise he speaks of a truth having been verified by experience until it has come to the notice of illiterate men and women. This truth is that the weakened powers of age can to some extent be restored, and as a proof of this assertion Arnald presently adduces the invention of eye-glasses,[3] which are likewise mentioned by his contemporary, Bernard Gordon.[4] We also have observed in Arnald the usual inclination to base marvels upon experience, as in "the marvelous and elect experiment" of Socrates or the cure of gout by binding on frog's legs.

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[1] *Medic. Introd. Spec.*, cap. 20.

[2] *Repetitio super Canon 'Vita Brevis'*, fol. 276.

[3] *De conserv. iuvent. et retard. senectute*, "Palam autem est quia obiectum politicum et diaffanum est aggregatum visus eius congregans disgregatum.

[4] Bernard's mention of eye-glasses in his *Lilium medicinae*, Venice, 1496, Partic. III, cap. v, fol. 94, is both more incidental and more specific. At the close of his "ninth experiment" for the eyes, a formidable mixture, he says, "et est tantae virtutis quod decrepitum faceret legere litteras minutas sine ocularibus." Magnifying lenses have of course been mentioned earlier by Grosseteste; see above p. 441.

Bernard Gordon also mentions "experimenters," *Lilium* V, 12, fol. 159, "et dicunt experimentatores."

Further foibles of Arnald's medicine.

In conclusion some foibles of Arnald's medicine may be noted which do not exactly fall under any of the preceding heads. In the treatment of mania in the *Breviarium* he advises as a last resort that the skin be cut in the form of a cross and the skull perforated so that the noxious vapors may escape from the brain.[1] In another place he warns against washing the head too often, "since thereby many have lost their sight before their time." [2] He advises to lave the eyes not with cold but with tepid water, and recommends as especially beneficial to the eyes washing with one's own urine when one rises from bed in the morning, or with one's own saliva. Throughout this same work he repeatedly recommends the most awful concoctions as remedies, but perhaps the climax in the way of a series of complicated recipes occurs in his *Treatise against the Stone,*[3] a disease for which he had treated the pope. In his collection of antidotes [4] we again run across the Potion of St. Paul and the opiates supposed to have been discovered by the emperor Hadrian and the prophet Esdras.

The affair of Bernard Délicieux.

The trial of Bernard Délicieux [5] before the inquisition should perhaps be mentioned at this point as a connecting link between Arnald of Villanova of whom we have just treated and Raymond Lull to whom the next chapter will be devoted, especially as the tendency of this affair would appear to be to bring both of them into disrepute with the inquisition and under suspicion of magic. Thus two citizens of Albi testified that on the eve of Benedict XI's death Bernard Délicieux or Delitiosi sent a leather chest wrapped in waxed cloth to Arnald of Villanova at the papal court, the imputation being that Arnald helped Bernard to poison the pope. Furthermore, Bernard was found to have in his possession a book of nigromancy which he said Raymond Lull, a Catalan of Majorca, had given to him at Rome. No doubt this evidence against Raymond and Arnald is very flimsy; Bernard himself was freed of the charge of poisoning;[1] still, it may have done them some harm.

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[1] *Breviarium,* I, 26.

[2] *Ibid.,* I, 13.

[3] *Tractatus contra calculum.*

[4] *Antidotarium.*

[5] HL 29, 276; Lea, *Hist. of Inquisition of Middle Ages* (1888) III, 452; but especially B. Hauréau, *Bernard Délicieux et l'Inquisition Albigeoise,* Paris, 1877.

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[1] Diepgen (1909), pp. 36-7. The further articles by Diepgen on Arnald, alluded to above on p. 842, note 3, appeared in *Arch. f. Gesch. d. Med.*, V., 397-9; VI (1913) 380-91; and in *Arch. f. Kulturgesch.*, IX (1912) 385-403, "Arnoldus de Villanova *de improbatione maleficiorum*."

CHAPTER LXIX

RAYMOND LULL

Life and works—Orthodoxy questioned—His natural science not unusual—His Art Universal—Circular figures employed in theology—Figure of a tree used in medicine—Lull and alchemy—His attitude to astrology—To the condemnation of 1277 at Paris—His book on medicine and astrology—An uncomplimentary allusion to thirteenth century medicine—Necromancy and divine names.

Life and works.

RAMON LULL or Raimond Lulle or Raymund Lull or Raymond Lully, to mention some of the forms of his name which have prevailed in different languages and times, appears to have been one of the most energetic and versatile characters of the thirteenth and early fourteenth century.[1] Born in 1235 or 1236 or possibly a year or two earlier at Palma in the island of Majorca, he seems to have spent his youth as a pleasure-loving courtier, if not libertine, and to have initiated by the composition of love verses the long series of poems and treatises in Catalan which make him a prominent figure in the history of medieval Spanish literature.[2] At about the age of thirty he underwent a conversion not unlike that of Saint Francis and thenceforth devoted himself to learning and religion. This combination was characteristic of him and he has been charged with holding that all the mysteries of the Faith could be proved and comprehended by reason and with "removing all distinction between natural and supernatural truth." [1] His chief contribution to learning was the method of his Art, of which more presently. But he was a voluminous writer upon a great variety of themes, some of which border more closely on the field of our investigation. Some of these works at first sight may seem to have little connection with what appears to have been Lull's main object in life, namely, the conversion of the Mohammedan world and the rescue of the holy sepulcher.[2] But his crusading and missionary methods were somewhat peculiar, involving not only a long preparatory educational period, especially in the study of oriental languages, but also the refutation of Arabian philosophy, particularly that of Averroes, and toward that goal the conciliation of philosophy and theology in the Christian world. In 1276 he persuaded the king of Aragon to establish a school for the study of Arabic in Majorca, and in 1311 at the Council of Vienne he persuaded the pope to authorize chairs in Greek, Hebrew, Chaldean and Arabic at Rome, Paris, Oxford, Bologna, and Salamanca. He failed, however, in his effort at this council to obtain a prohibition of Averroistic teaching in Christian universities. Lull himself, besides teaching in his own school in Majorca, lectured on his Art at Paris, Montpellier and elsewhere. But he also was an active field missionary, converting Saracens not only in the Balearic Isles but also in Cyprus and Armenia, while he went three times to North Africa. On the first occasion he was imprisoned and then banished, on the last he was stoned to death. This martyrdom, added to his fame as a poet and scholar, has made him the national saint of the Balearic Isles, but he actually has only been beatified and not canonized. He appears to have been a member of the third order of St. Francis. His will, drawn up in 1313 and brought again to light in 1896, shows that he had children.[1] His death occurred on the 29th of June, 1315.

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[1] A number of works on Lull have appeared recently: M. André, *Le bienheureux Raymond Lulle*, 3rd edition, Paris, 1900; S. M. Zwemer, *Raymund Lull, First Missionary to the Moslems*, New York, 1902; W. T. A. Barber, *Raymond Lull, the illuminated doctor: a study in medieval missions*, London, 1903; J. H. Probst, *Caractère et origines des idées du bienheureux Raymond Lulle*, Toulouse, 1912. By Barber also the article "Lullists" in ERE. The fullest discussion of Raymond's writings seems to remain, however, that in HL 29: 1-386, which includes works still in MSS. The most accessible edition of the works in print is perhaps that of Salzinger, Mainz, 1721-1742, in ten folio volumes. The *Revista Lulliana* was started at Barcelona in 1901.

[2] A. Helfferich, *Raymond Lull und die Anfänge der catalonischen Literatur*, Berlin, 1858.

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[1] William Turner, in CE.

[2] A. Gottron, *Ramon Lulls Kreuzzugsideen,* Berlin, 1912.

Orthodoxy questioned.

The chief reason why Lull has never been canonized is the doubt that has prevailed as to his complete orthodoxy, a matter more than once questioned. Eymeric (1320-1399) when Inquisitor-General of Aragon attacked the doctrines of Lull, listing five hundred passages in his works as heretical and claiming that Gregory XI had condemned two hundred in a bull of 1376,—which has not been found. It is thought that the bull meant is one against a converted Jew, Raymond of Tárrega who had turned renegade and written works on magic. At any rate in 1386 another inquisitor at Barcelona cleared the views of Lull from suspicion. The University of Majorca established by King Ferdinand the Catholic became a great center of Lullism. Then in the middle of the sixteenth century Lull's works were placed on the *Index Expurgatorius,* but were removed before the close of the century. It may seem strange that the relations between Lullism and the Inquisition and Index were not more cordial, since they are often both represented as pursuing the same quarry, Averroism, of which we are told, "Lullism always provided its strongest foes."[2] But we rather suspect that "Averroism" was in the nature of an air-drawn phantom whose assailants were apt to injure one another.

His natural science not unusual.

Probst regards Lull as in advance of his age in his use of observation and experimental science and his knowledge that the world was round and acquaintance with the mariner's compass.[3] This knowledge, however, he really shared with his times and we can scarcely regard him as a precursor of Columbus nor even quite as an equal of Roger Bacon in these respects, exaggerated as we believe the estimates to be which have often been made of Roger's importance. But Probst shows a similar tendency to exaggerate the scientific importance of Lull at the expense of his period.

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[1] Don Francisco de Bofarull y Sans, *El Testamento de Ramón Lull y la Escuela Luliana en Barcelona,* Madrid, 1896, 96 pp. Extract from vol. 5 of *Memorias de la Real Acad. de Buenas Letras de Barcelona.* L. Delisle, *Testaments d'Arnaud de Villeneuve et de Raimond Lulle, 20 juillet* 1305 *et 26 avril* 1313; *Extrait du Journal des Savants,* June, 1896.

[2] Barber in ERE.

[3] Probst (1912) chapter 8, "Lulle Savant," especially pp. 156-7, 164-5, 171. The chapter appears to be written almost entirely from secondary sources and shows an insufficient knowledge of the middle ages in general.

His Art Universal.

Lull's chief original contribution to medieval learning bore scant relation indeed to the methods of observation and experiment. His famous Art came to him as a sudden inspiration in the midst of long study and reflection and was, he and his followers believed, received by direct divine illumination. Hence his title, "the illuminated Doctor." In reality the method of his Art leads us to infer that it occurred to him by some process of sub-conscious association with the employment of the planisphere in astronomy or the use of a revolving wheel and tables of combinations of letters of the alphabet such as we have noted in the geomancies and modes of divination ascribed to Socrates, Pythagoras, and other philosophers. Lull's idea seems to have been the invention of a logical machine which would constitute the same sort of labor-saving device in a scholastic disputation or medieval university as an adding machine in a modern bank or business office. By properly arranging categories and concepts, subjects and predicates in the first place, one could get the correct answer to such propositions as might be put. Another advantage of this method would be that a sceptical Arab, who might refuse to listen to or view with suspicion the verbal arguments of a missionary, would be irresistibly convinced of the truth of the doctrines of Christianity by this machine, or at least mechanical method, which would impress him as impartial and reliable. Lull's diagrams and mechanical devices included a tree, intersecting triangles, and concentric circles divided into compartments, of which one rotated something like the planets in the signs while the other remained stationary like the sphere of the fixed stars.

In questions of theology a circle was employed whose center stood for God while its circumference divided into

Circular figures employed in theology.

sixteen "chambers" representing kindness, grandeur, eternity, power, wisdom, will, virtue, truth, glory, perfection, justice, beneficence, pity, humility, dominion, and patience. One hundred and twenty more "chambers" were formed by combining pairs of the foregoing. Another circle shows the rational soul in the center represented by four squares and has its circumference divided into sixteen compartments representing appropriate qualities. A third circle, devoted to principles and meanings, enclosed five triangles in a circumference of fifteen compartments; while a fourth circle divided fourteen compartments of its circumference between the seven virtues and seven vices respectively rendered in blue and red. Other "figures" dealt with predestination, fate, and free-will, truth, and falsity. The following is a specific instance of the way in which these were combined. When the rational soul is troubled and uncertain in the circle of predestination, because the chambers of ignorance and merit, science and fault, mingle together, it forms a third figure representing doubt.

Figure of a tree used in medicine.

In medicine the figure of a tree was employed. At its roots a wheel divided into quarters signifying bile, blood, phlegm, and atrabile. The tree had two trunks, on one of which bloomed the principles of ancient medicine. Its first branch, the natural, bore seven flowers: the elements, complexions, humors, members, faculties, operations, and spirits; and four figures dependent on these, namely, ages, colors, shapes, and sexes. The second non-natural branch produced six flowers: air, exercise, food and drink, sleep and activity, emptiness and surfeit, and the accidents of the mind. The third bough, or contrary to nature, had three flowers: disease and its causes and results. The other main trunk had two boughs. One divided into hot and cold, moist and dry, and the four degrees of each. The other bore three triangles and a square. The red triangle represented the source, the middle, and the end; the green triangle stood for difference, agreement, and contrariety; the yellow triangle comprised majority, minority, and equality.[1] The square divides into four colors: red for being; black for privation; blue for perfection; green for imperfection.[2] Such are some of the diagrams of the Lullian art, intended presumably to be worked by cranks or levers. There is really nothing magical about them; they are purely mechanical and representative and illustrative. But in their make-up they are certainly suggestive of a Gnostic or Ophite diagram or of a geomantic wheel, and possibly may sometimes have been suspected of being magical by outsiders.

Lull and alchemy.

The use of the word "Art" for this logical machinery and graphic method of Raymond Lull perhaps also led to the notion that he was an alchemist and exponent of the Hermetic art. Various works of alchemy were ascribed to him but are regarded as spurious; perhaps some of them are by the Jew, Raymond of Tárrega, already mentioned. No work of alchemy is mentioned in the lists of his writings drawn up in 1311 and 1314,[3] and the sixth part, devoted to metals, of his *Libre de les Maravels* is unfavorable to alchemy.[4] In his Latin *Questions Soluble by the Demonstrative or Inventive Art* he again adduced reasons against transmutation.[5] De Luanco has collected other passages from Raymond's undisputed works unfavorable to alchemy and the alchemists.[6] We have seen, however, that a writer may criticize most or all other alchemists sharply and question various doctrines and methods of alchemy and yet have his own way of getting around the difficulties whether theoretical, such as the permanence of species, or practical. There is therefore something to be said for the position of Barber who, while recognizing that the treatises current under Raymond's name are spurious, adds, "We can well believe that he wrote as well as thought on alchemy." [1] And it was Berthelot's opinion that while the works ascribed to Raymond are spurious, "nevertheless it is incontestable that those writings were composed by persons who believed themselves his disciples." [2] These spurious works were in existence at an early date and Raymond is cited as an alchemist from the fourteenth century on.

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[1] I have seen in Digby 85, fols. 152r-86v, *Speculum medicine* (of Lull) which is mainly devoted to a discussion of these three triangles.

[2] For this and the preceding paragraph on the circles employed in theology I have followed the descriptions in HL 29: 75 ff. and 87 ff.

[3] HL 29: 271.

[4] HL 29: 354. The work is in Catalan; the other nine parts treat of God, angels, elements, sky, plants, beasts, men, Paradise, hell.

[5] HL 29: 139. *Quaestiones per artem demonstrativam seu inventivam solubiles.*

[6] J. R. de Luanco, *Ramon Lull considerado como alquimista*, Barcelona, 1870.

His attitude to astrology.

If Lull was an opponent of the art of transmuting metals rather than an adept in alchemy, he was at least a believer in astrology as several of his works show. It is true, and this is the more important to note as suggesting how Lull's utterances on the subject of alchemy may also have been misunderstood, that the *Histoire Littéraire de la France,* in describing Raymond's *Tractatus novus de astronomia,* written in 1297, gives the impression that it is directed against astrology, stating that Lull says that he has written it "to dissuade princes and magnates from trusting in the divinations of astrologers," and adding, "Less worthy of praise is the second part of the work where the author assumes to apply to astronomy the principles of his art universal." [3] An examination of the treatise itself in manuscript [4] shows that it is only of certain astrologers and diviners who deceive princes by false judgments from the stars that Raymond would have royalty beware. He writes his book not because "astronomy" (i.e. astrology) is false but because it is so difficult that often judgments made by the art turn out false, and because he wishes to investigate and discover new methods by which men can have greater knowledge of "astronomy" and its judgments. When he comes to speak of the properties of each planet, he remarks that "astronomers" attribute many properties to Saturn but do not prove them. He intends to employ his Art in investigating Saturn's properties, and comes to the conclusion that men born under that planet are, among other traits, ponderously grave, suspicious by nature, disposed to toil and to build great edifices, and ambitious to hold office.[1] Later on we find him spending many pages in listing different combinations of the planets in the signs as fortunate or unfortunate.[2] All this, of course, is judicial astrology rather than astronomy. He "proves" also that the sky is animated by a moving and circular soul or spirit, and he states that "astronomers" recognize in their judgments that this soul of the sky is the cause of things caused in our inferior world.[3] After a while, however, he does reprove "the philosophers who invented the science of astronomy" for "certain points in this science in which they have erred," namely, in making it necessary and inevitable. Lull holds that God can alter nature as the smith alters the direction of his falling hammer, and that the human mind has free will to resist the influence of the stars.[4] But this criticism of astrology is neither novel nor entirely justified. Lull never disputes but always accepts the theory that the heavenly bodies shed their influence and virtue upon inferiors. He does, however, speak slightingly of the art of geomancy and its practitioners.[5]

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[1] "Lullists" in ERE.

[2] Berthelot, *La chimie au moyen âge,* vol. I.

[3] HL 29: 309.

[4] I have used CLM 10544, fols. 287r-368r, to which the following citations apply, and CLM 10597, which includes only the portion concerning the twelve signs and seven planets.

To the condemnation of 1277 at Paris.

In the same year 1297 in which Raymond wrote the treatise just summarized he also published an imaginary dialogue dealing with the 219 opinions which had been condemned at Paris in 1277.[6] In this dialogue "Socrates" undertakes the defense of philosophy while Raymond supports theology and the articles of condemnation. We have seen that a number of the opinions condemned were astrological in character. Raymond does not join in active condemnation of all of these, passing over a number in silence and perhaps intentionally evading them. On article 30, "that superior intelligences create rational souls without the motion of the sky; but that inferior intelligences create the vegetative and sensitive souls by means of the motion of the sky," Raymond's comment is that creation is the proper function of God. To Socrates' repetition of the sixty-first article, "that God can do contrary things, that is, by means of a celestial body which is diverse in its whereabouts," Raymond replies that God can act directly and produce contraries without the intervention of any heavenly body, if He wishes to, as He did in creating the four elements with their contrary qualities of hot and cold, dry and moist. Raymond adds, however, that God would not produce sins, since He is perfect in goodness. In reply to articles 92 and 102, that the heavenly bodies are moved by a soul and by appetitive virtue just like an animal, and that the soul of the sky is intelligence, Raymond answers that in his opinion it is correct to say that the sky has a motive soul but not a vegetative or sensitive or imaginative or rational soul. "If, however, I am not speaking the truth in this, I am prepared to receive correction; but I believe that I am speaking truly." Raymond also upholds human free will as in the preceding treatise. The close of the present dialogue is, at least on the surface, an edifying instance of submission to ecclesiastical authority. Socrates asks Raymond if the theologians believe as he has been saying. Raymond replies that he believes so, since he has proved his own statements and believes them to be true, and he knows that the venerable lords and doctors of theology who are pillars of the Christian Faith believe only what is true. If, however, he has erred, it is unwittingly and unintentionally, and he humbly supplicates those most powerful masters to correct the words of their weak servant. Socrates chimes in that he has merely been repeating for his part what the ancient philosophers said, but that if any of it is contrary to Christianity, he does not want to believe it. He therefore proposes that they go to Paris and submit the book to the theologians there for their approval or correction, as his desire is to see "great concord between my lords the masters in theology and in philosophy." It seems evident that behind his humble tone Lull is trying to soften down the condemnation of 1277 and substitute a somewhat more conciliatory attitude.

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[1] Fol. 291v-292r.

[2] Fol. 342v *et seq.*

[3] Fol. 336r.

[4] Fols. 357-9.

[5] Fol. 360r.

[6] P. O. Keicher, *Raymundus Lullus und seine Stellung zur Arabischen Philosophie, mit einem Anhang enthaltend die zum ersten Male veröffentlichte "Declaratio Raymundi per modum dialogi edita" (contra aliquorum philosophorum et eorum sequacium opiniones erroneas et damnatas a venerabili Patre Domino Episcopo Parisiensi)* pp. 95-221, in *Beiträge,* VII, 4 and 5 (1909).

The book of Raymond on medicine and astronomy.

Lull's attitude to astrology is further illustrated by a treatise in which he applies the method of his Art universal to the subject of astrological medicine.[1] "Since the science of medicine is very difficult on account of its principles being so secret," Raymond proposes to investigate them by means of his Art. His treatise has three divisions: the first, concerning the inferior world of the elements and the body of the human patient; the second, concerning the regions of the celestial bodies; and the third, consisting of questions. Raymond denotes the four elements by the letters from a to d, and the combinations of heat or cold with humidity and drought by the letters from e to h. He then introduces a figure with two circles representing the eighth sphere and the zodiac, since the motion of the planets controls that of the human body. These two circles are each divided into eight "houses," which correspond to sixteen pairs of letters consisting of each of the four elements joined with each of the four letters denoting pairs of qualities, namely, ae, af, ag, ah, be, bf, bg, bh, ce, cf, cg, ch, de, df, dg, and dh. Raymond then discusses such topics as fevers, the pulse, evacuation, diet, bleeding, bathing, the color of the urine, digestion and indigestion, pains, appetite, and the method of grading medicines. The relation of his letters and "houses" to these matters may be seen from his statement that the house of *ae* causes one kind of appetite, that of *be* another, and so on. Coming to the second section of his treatise, Lull treats of the planets and signs and relates the conjunctions of the various planets with one another to his eight letters and their combinations. In the third part he puts illustrative problems and solves them by reference to his preceding text.

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[1] Digby 85, early 15th century, fols. 131-49r, "Liber Raymundi de medicina et astronomia" (In Antonius, *Bibl. Hisp. Vet.* II, 129, "Liber de regionibus infirmitatis et sanitatis"). According to Macray the opening words are "Quoniam scientia medicine est multum difficilis," but the first word appears as "Quum" in my notes on the MS. "Explicit Medicina Raymundi in Monte Pessulano anno Christi 1403," on which Macray comments, "(*sic; rectius* 1303)" but perhaps 1403 is the date of this copy. This MS contains other works by Lull on his Art and on medicine.

An uncomplimentary allusion to thirteenth century medicine.

We might think Lull an opponent of medicine, if we attended only to a passage in his *Contemplation of God.*[1] Here he complains that doctors of the body are more sought after, better paid, more scrupulously obeyed than are physicians of the soul. They go well clad on good steeds, and amass wealth by working all sorts of impositions upon their patients, boasting of their knowledge of diseases of which they are really ignorant, prolonging the period of illness in order to increase their pay, and prescribing syrups and the like in large quantities because they share in the profits of the apothecaries. They try out potions on their patients which they would never take themselves, and there is no other art in the world so risky and over which there is so much disagreement. These remarks of Raymond are, however, the sort of satirical observations on medical practice that might be made at almost any period, so that it is difficult to tell if they are especially applicable to the thirteenth century.

Necromancy and divine names.

In closing we may note two brief indications of Lull's belief in two other occult subjects, namely, necromancy and the power of divine names. Of necromancy he of course did not approve but in the treatise just cited he adduces the art of necromancy as evidence for the existence of God, since it requires the services of demons and they are no other beings than fallen angels who owe their existence to God.[2] This somewhat tortuous theistic argument we have already

[1] HL 29:230. *Liber contemplationis in Deum.*
[2] HL 29:233.

heard advanced by Justin Martyr. In his treatise in Catalan on *The Hundred Names of God* Raymond asks, "Since God has put virtues in words, plants, and stones, how will He not have put far greater virtue into His names?" [2]

[1] HL 29: 265-6; *Els cent Noms de Deu.*

CHAPTER LXX

PETER OF ABANO

Plan of this chapter—Birth and family—Travels abroad—At Paris—His Latin version of Abraham Aben Ezra—Conversation with Marco Polo—Translations from the Greek—Did he teach at Bologna?—Return to Padua—Three works of astronomy and astrology—Publications in the year 1310—Undated and spurious works—Closing years of his life—Relations with the church—Great reputation—Not a miracle in a rude age—But completed the work of his period—No mere compiler—The *Conciliator* his masterpiece—Its method—Specimens of its questions—Was Peter the founder of Averroism at Padua?—Reputation for magic—Summary of occult science in the *Conciliator*—Definition of astronomy and astrology—Nature controlled by the stars—Astrology a science—And not magic—Occult virtues from the stars—Astrological medicine—The stars and length of life—Nativities—Revolution of the eighth sphere—Conjunctions—The astrological interpretation of history—Chronology—Astrological images—The stars and invocations, incantations, and fascination—Stars and spirits—Were Peter's views heretical? — Fascination—Incantations—Number mysticism—Poisoning and magic—The treatise *De venenis*—Specific form or valence—An allusion to alchemy—Mineral, vegetable, and animal poisons—How poison takes effect—Safeguards against poison—The Bezoar—Physiognomy—Astrology in his other works—Attitude to "magic"—Magic books ascribed to him—Geomancy—Conclusion.

Appendix I. Previous accounts of Peter of Abano.
Original sources—Michael Savonarola—Secondary accounts since 1500.

Appendix II. A Bibliography of Peter Abano's writings.
Arrangement—Translation of Abraham Aben Ezra, 1293—The *Physiognomy*, 1295—*Problems* of Alexander of Aphrodisias—Translations of Galen—The *Conciliator*, 1303—*On the astrolabe*—*On the motion of the eighth sphere*, 1310—The *Lucidator*, 1310—Commentary on the *Problems* of Aristotle, 1310—*On poisons*, 1316(?)—*Addition to Mesuë*—Dioscorides—Pseudo-Hippocrates—Geomancy—Prophecies—*Heptameron*, or *Elements of magic*—*Elucidarium necromanticum*—*Annulorum experimenta*—*Circulus philosophicus*.

Appendix III. Peter of Abano, Abraham Aben Ezra, and Henry Bate.
French translation from the Hebrew—Peter's Latin version—Addi-

tional treatises in Peter's version—A Latin translation by Henry Bate—Other writings of Henry Bate—Other works by Abraham.
Appendix IV. Was Peter called to Treviso in 1314?
Appendix V. Peter's salary at Padua.
Amount exaggerated—Why was it so far in arrears?
Appendix VI. When did Peter die?
Appendix VII. Was the *De venenis* addressed to Pope John XXII?
Survey of the editions and MSS—Inference from a citation of Avenzoar—Popes and poisons.
Appendix VIII. Peter and the Inquisition.
His own statement in the Conciliator—His professions of orthodoxy—Does his will show fear of the Inquisition?—Gloria's inference—Did Peter's sons inherit his property?—If so, how?—Burning of Peter's bones for heresy—The account of Michael Savonarola—Scardeone's account—Naudé's statement.

> "*. . . he reconciled conflicts, a wonderful warrior!*"
> —*Tomasini (1630) p. 22.*

Plan of this chapter.

PETER OF ABANO, or Peter of Padua, as he was often called from the larger city near his birthplace where he did much of his teaching, was one of the most influential men of learning during the last years of the thirteenth and the opening years of the fourteenth century. Of his writings in medicine, philosophy, and astronomy many are extant, and most of these in printed editions. Yet he has never been adequately or accurately treated in English. In our language there have merely been brief notices of or incidental references to him in histories of science and medicine, or of the inquisition and of rationalism in Europe, or in general encyclopedias. Such passages and parallel ones in foreign languages [1] often give dates of Peter's life or death incorrectly, or do injustice to his opinions from an insufficient or very indirect knowledge of his works, or represent him as a victim of the Inquisition and an example of the hostility of the medieval church to science to an extent which the sources do not justify. There are, however, in European languages, especially Italian, some secondary studies of importance concerning Peter. It is upon these and a direct examination of his works that the present chapter will be based. To avoid prolixity of text and footnotes, details of bibliography [1] and a number of problems concerning his life which require to be discussed at some length have been transferred to appendices at the close of the chapter. In the present text, since most of Peter's works can be dated rather exactly and since they were among the chief events of his life, we may combine biography and bibliography in large measure. We shall then treat somewhat, although by no means adequately, of his place in the history of science, and finally of his propensities toward astrology and other varieties of magic.

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[1] As distinguished a scholar as Steinschneider (1905), pp. 58-9, for example, gives the date of his birth as 1253 or 1246.

Birth and family.

Peter's own statements in his chief work, the *Conciliator,*[2] show that he wrote it in the year 1303, after having worked it over in class-room lectures and discussions for ten years previously, and that he was fifty-three years of age at that time. In other words, he was born in 1250. On one point of his biography more precise and scientific detail is forthcoming than is customary in the lives of the great men of the past, for he confides exactly how long a time elapsed before his birth, nine months and fourteen days, as he had learned by astrological scrutiny and from his "most careful mother." [3] In his will Peter gives his father's name as Constantius of Abano,[4] and he was probably the notary of that name whose tombstone inscription has been preserved.[5] Scardeone stated that Peter had one son named Benvenuto,[6] whose name also appears in a list of inhabitants of Padua in 1320 [7] and who took part in a street fight there in 1325.[8] Gloria was the first to call attention to two other sons, named Pietro and Zuffredo, whose names appear together with their brother's in deeds of sale and of inheritance of November 19, 1318, and February 2, 1321. Gloria was of the opinion that these sons were illegitimate, and Peter's failure to make them his heirs in his will may perhaps be so interpreted, but they are not called natural sons in the documents.

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[1] Appendix I, "Previous Accounts of Peter of Abano," describes the sources and secondary accounts. Appendix II, "A Bibliography of Peter of Abano's Writings," lists the editions and MSS of his works used in this chapter and some others.

[2] Preface and Diff. 9.

[3] Diff. 49.

[4] Verci (1787) VII, *Documenti,* p. 116.

[5] Salomoni, *Inscriptiones Urbis Patavinae,* p. 323; Scardeone (1560), p. 202; Mazzuchelli (1741), pp. v-vi; Colle (1825) III, 128.

[6] (1560), p. 202, "Huic unicus fuit filius Beneventus nomine."

[7] Gloria (1884), p. 587.

[8] *Chronicon Patavinum, anno* 1325, in *Muratori, Antiquitates* (1778), XII, 252.

Travels abroad.

At some time of unknown date Peter was in Sardinia, where he says he saw a case of poisoning from "Pharaoh's fig,"[1] and at Constantinople, where he discovered a volume of the *Problems* of Aristotle, which he translated into Latin for the first time. It was probably there too that he saw a Greek version of Dioscorides arranged alphabetically—his own edition of Dioscorides follows another text, the medieval Latin version—and secured the works of Galen and other treatises which Michael Savonarola[2] says that he translated from Greek into Latin. Peter is also said to have visited Spain, England, and Scotland, but I have found no proof of this, although allusions to such visits may possibly occur somewhere in his voluminous works.

At Paris.

A number of years of Peter's life were spent at the University of Paris, where Michael Savonarola states that he was regarded as a second Aristotle and called "the great Lombard." There he wrote his work on Physiognomy (*liber compilationis phisonomie*) which he dedicated to Bordelone Bonacossi who was captain-general of Mantua from 1292 to 1299. In the version which has reached us and which is dated 1295 Peter alludes to an earlier draft which had gone astray and had failed to reach its destination in Italy.

His Latin version of Abraham Aben Ezra.

In 1293 Peter found astrological writings of the Jew, Abraham Aben Ezra, who had flourished at Toledo in the twelfth century, defectively translated from Hebrew into French,[3] and therefore published a Latin revision of his own, apparently also adding treatises which had not been included in the previous translation.[1] This raises the question whether Peter was acquainted with Hebrew and Arabic,[2] or whether he may have used a Greek version of Abraham's treatises in correcting the French one. At any rate Peter's Latin version of Abraham's astrological works had a widespread influence, as it was retranslated into various European vernaculars and apparently even back again into Arabic.[3]

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[1] *De venenis*, cap. 47.

[2] In Muratori, *Scriptores*, XXIV, 1135-8. Savonarola's account of Peter is so brief that it does not seem necessary to cite it further by page.

[3] HL XXI, 500-3.

Conversation with Marco Polo.

Peter talked with the famous oriental traveler, Marco Polo, at some time between the latter's return to Venice in 1295 and the completion of the *Conciliator,* in which he cites Marco's statements to him concerning tropical countries near the equator.[4]

Translations from the Greek.

A translation of the Problems of *Alexander medicus* is ascribed to Peter in the list of his works in a fifteenth century manuscript.[5] This can hardly refer to Alexander of Tralles. Perhaps what is meant is a translation of the Problems of Alexander of Aphrodisias, of which I know only one manuscript where it is dated 1302. Savonarola. however, states that Peter translated the Aphorisms of Alexander and also the Rhetoric of Aristotle, but the latter translation does not seem to be extant. Some at least of Peter's translations of Galen's works would appear to have been executed before 1303, since they are referred to by him in the *Conciliator.* Also two of them are found in manuscripts dated as early as 1304 and 1305, the latter containing Peter's completion of the translation of Galen's *Therapeutic Method* begun by Burgundio of Pisa.

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[1] The problem of Peter's and other translations of Abraham is discussed more fully in Appendix III.

[2] Steinschneider (1905), pp. 58-9, asserted that Peter did not translate Abraham either from Arabic or Hebrew. Peter himself uses the verb "ordinavi" rather than "transtuli" of his version; see his *Tractatus de motu octave spere,* II, 3, in Canon. Misc. 190, "Unde abraam evenere cuius libros in linguam ordinavi latinam."

[3] Steinschneider (1880), p. 126. He further states that what seems to be a partially divergent Spanish translation of some works of Abraham (Rodriguez de Castro, *Bibl. Españ.* I, 25-6) was "again translated into Latin by the Spaniard Louis of Angulo (Wolf, *Bibl. Hebr.,* I, 83, now Cod. Paris 734)". But BN 734 contains only a "Liber ordinis pontificalis per Gulielmum Durantum." What is probably meant is BN 7321, fols. 87-116, "Explicit tractatus de nativitatibus abrahe avenzre translata de ydyomate cathalano in latinum a lodovico de angulo hyspano in civitate lugdunensi anno Christi 1448.

[4] Conciliator, Diff. 67.

[5] Canon. Misc. 46, fol. 30v, "Item transtulit problemata Alexandri medici dria. gnta" (differentiae quinquaginta).

Did he teach at Bologna?

This last manuscript was written at Bologna in 1305 and is about the only evidence we have to support the old tradition, which was already questioned by Mazzuchelli, that Peter taught at Bologna.[1]

Return to Padua.

Savonarola seems correct in stating that Peter completed the *Conciliator* and began the composition of his Commentary on the Problems of Aristotle at Paris, and the *Explicit* of the latter work likewise states that Peter wrote part of it in Paris and finished it at Padua in 1310. He left Paris therefore at some time after 1303 and returned to Padua at some time before 1310. Apparently he might have been in Bologna in 1305 but in 1307 he is listed as a member of a gild in Padua.[2] Grabmann in his recent researches concerning the thirteenth century translations of Aristotle has called attention to a translation of the History of Animals made from the Greek in 1260 and of which Peter of Abano purchased a copy in 1309 from Francesco of Mantua for the price of seven Venetian *soldi.*[3]

Three works of astronomy and astrology.

In the *Conciliator* Peter refers a number of times to three works of his in the fields of astronomy and astrology, namely, a treatise on the astrolabe, another on the motion of the eighth sphere, and a work entitled *Lucidator,* of which the preface and a few chapters are extant and which perhaps was never finished, since such allusions to the work in the *Conciliator* as I have noted are to these few chapters, while from the nature of these same allusions to the *Lucidator* and from its own preface one would expect it to be of somewhat the same length as the bulky *Conciliator,* since it was to discuss disputed points in the fields of astronomy and astrology in the same way that the *Conciliator* discussed them in the field of medicine.

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[1] Mazzuchelli (1741), p. xi. He was not, however, aware that in a 1555 edition of the *De venenis* a prefatory note states that Peter taught at Bologna.

[2] Gloria (1888) II, 10.

[3] *Beiträge z. Gesch. d. Philos. d. Mittelalters* (1916), p. 247, citing Zassari, *Cesena MSS* (1887), p. 316, Cod. Plut. IV-n-4, S. XIII.

Publications in the year 1310.

But we now encounter the seeming difficulty that, while both the *Lucidator* and work on the motion of the eighth sphere are cited in the *Conciliator,* which was finished in 1303, they both mention 1310 as the date of their composition. A further indication that the *Lucidator* was published after the *Conciliator* is that in its preface Peter states that its method and arrangement will be similar to those of the *Conciliator,* which is also cited later in the text itself.[1] Apparently, therefore, Peter had written first drafts of the two astronomical works before he finished the *Conciliator* in 1303, but did not complete or publish them until 1310. In that same year, as we have seen, he completed his Commentary on the Problems of Aristotle.

Undated and spurious works.

No definite date can be assigned for some of Peter's works, namely, his continuation of the *Grabadin* of the Arabian physician, Yuhanna ibn Masawaih, to whose second book on remedies appropriate to diseases of particular parts of the body he added a discussion of remedies for complaints of the heart and digestive organs, and his edition of the medieval Latin version of the *Materia medica* of Dioscorides, of which we have treated in an earlier chapter.[2] Peter is also credited with a Latin edition of the little tract on astrological medicine, or prognostication of diseases according to the motion of the moon in the signs; but a Latin translation of the same work is also attributed to William of Moerbeke who lived a little earlier. Some other medical treatises that have been ascribed to Peter, like the Questions on Fevers, listed in Mazzuchelli's bibliography, are really portions of the *Conciliator.* Works of geomancy and magic attributed to Peter and probably spurious will be described more fully later in connection with those subjects.

Closing years of his life.

It has been stated by more than one author that Peter went to Treviso to teach medicine in 1314, but it is doubtful if he even received a definite call from that city, although it had his name under consideration.[1] His salary at Padua has repeatedly been stated at the high figure of five hundred pounds or lire a month but this amount really represents his annual stipend.[2] He must, however, have been fairly well-to-do—we have hints that his practice was lucrative—for in 1315 when he made his will he had not been paid any salary for three or four years, and yet had considerable property. Peter was dead before the close of 1318,[3] but the apparent attribution of his work on poisons to Pope John XXII [4] makes it seem that he lived beyond August, 1316. One manuscript of that treatise speaks of Peter as acting dean of Montpellier at that time, but this is unlikely.[5]

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[1] BN 2598, fol. 102r.

[2] See above, chapter 26, I, 610.

Relations with the church.

We have dubious stories and more reliable data to show both that Peter had intimate and friendly relations with popes, whom he seems to have served in a medical capacity and from whom he received patronage and protection, and on the other hand that he was in difficulties with the Inquisition.[6] Besides the fact that his work on poisons was certainly written for some pope, if not for John XXII, we have the tale that he was physician to Pope Honorius IV (1285-1287) and charged him one hundred florins a day.[7] On the other hand, we have the assertion of Thomas of Strasburg, Prior-General of the Augustinian Friars from

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[1] See Appendix IV for a fuller discussion of this matter.

[2] See Appendix V.

[3] See Appendix VI for further discussion of the date of his death.

[4] See Appendix VII. John XXII was elected August 7, 1316.

[5] Bibl. Naz. Turin H-II-16, 15th century, fol. 115v, "... temporis decano studii montispessulani...." The records of the University of Montpellier are unfortunately not well preserved for this period.

[6] See Appendix VIII, "Peter and the Inquisition."

[7] The sum has become 400 ducats in Hoefer, *Histoire de la Chimie*, Paris, 1842, I, 135, and Pouchet (1853), pp. 532-3. Colle (1823), p. 17, questioned the story on the ground that Peter at the age of thirty-five or thirty-seven would be too young to charge such a fee, and for the better reason that the chronicler Filippo Villani tells the same tale of a Florentine physician. A prefatory note to the 1555 edition of the *De venenis* states that when Peter taught at Bologna—which he probably did not do—he would not visit a patient outside of that town for less than fifty florins, so great was his reputation. Honorius IV therefore at first promised him a fee of one hundred florins but gave him one thousand when he recovered his health as a result of Peter's ministrations.

1345 to 1357 that he was present in Padua when the bones of Peter of Abano were burned for his heretical errors, and the statements of still later writers, which are perhaps after all merely unwarrantable inferences from Thomas's assertion and from Peter's own words in his will and the *Conciliator,* that Peter died while under trial a second time by the Inquisition, which had once before instituted proceedings against him unsuccessfully. But these matters require a longer discussion than seems advisable now and so will be treated of more fully in Appendix VIII to this chapter.

Great reputation.

The promptness with which Peter's works appeared in book form after the invention of printing and the number of times that the *Conciliator* and some others were reprinted attest his long continued reputation and popularity as a medical authority and man of broad general learning. Regiomontanus, the renowned mathematician of the fifteenth century, when lecturing on Alfraganus at Padua, delivered a public panegyric upon Peter of Abano.[1] It was perhaps to be expected that Michael Savonarola, grandfather of the famous friar who tried to reform Florence and himself a physician and medical writer of some note, should belaud Peter in his work on the great citizens of Padua in the past, which he wrote about 1445; and that these eulogies should be repeated in such books as Scardeone's *On the Antiquity of the City of Padua,* Naudé's *Apology for Great Men who have been falsely suspected of Magic,* Tomasini's *Eulogies of Illustrious Men adorned with pictures,* and Duchastel's *Lives of Illustrious Physicians.* But Peter's reputation at the close of the middle ages is also attested in a criticism of some of his views by Symphorien Champier which was written in 1514 and is found appended to the 1526 edition of the *Conciliator.* Champier's object is to correct Abano's errors, that is to say, those passages in the *Conciliator* where he regards Peter's views as bordering too closely upon magic or of too extreme an astrological character for a Christian. But he admits Peter's great medical reputation, stating that the most learned physicians praise the medical and philosophical views of the *Conciliator* and that Peter is believed to have surpassed all other Christian physicians in his study of medicine and advancement of truth. But, as Horace says, even Homer nods; hence Champier will correct Peter in a few points in order to enable lovers of Peter's doctrines to get the benefit of them without falling into his occasional errors.

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[1] Naudé (1625), p. 382.

Not a miracle in a rude age.

The writers of the Renaissance and of early modern times became so enthusiastic over Peter of Abano, and at the same time so failed to appreciate the character and accomplishments of medieval learning in general, that they were wont to depict him as a miracle of learning in a rude age—just as more recent scholars have over-estimated Roger Bacon's superiority to his time—and to regard the physician of Padua, like the author of the *Divine Comedy*, as a precursor of their own period rather than as a final representative and product of a rich earlier period of culture. Thus Scardeone in the sixteenth century spoke of him as the first medical translator from Greek into Latin since Roman days, forgetting earlier medieval translators of Greek medicine like Burgundio of Pisa and William of Moerbeke. And in the seventeenth century Tomasini called Peter "a man most illustrious, in genius, doctrine, and merits, in a rude and unhappy age," while Naudé declared him "a man who appeared as a prodigy and a miracle in his age." This depreciation of the times in which Peter had lived became accentuated, as in the similar case of Roger Bacon, by the report that he had been persecuted by the medieval church.

But completed the work of his period.

As a matter of fact, as Dante really closed the medieval period of the flourishing of vernacular literature and the age of romance, so Peter of Abano came in a sense at the close of a period or movement in the history of science. He thus not unnaturally occupied himself especially in supplementing, correcting, and reconciling the work of his predecessors. Some works that had been unsatisfactorily translated, he retranslated. Such important works of Aristotle, Galen, and others as he could find that had not yet been translated, he translated from Greek into Latin. He filled in the missing portion of the medical work of Yuhanna ibn Masawaih. And in his *Conciliator,* a tome of enormous bulk, he endeavored to reconcile and harmonize the conflicting opinions of the medical men and philosophers who had gone before him.

No mere compiler.

Pico della Mirandola at the close of the fifteenth century made a trenchant criticism of Peter's erudition, when he characterized him as "a man fitted by nature to collect rather than to digest." But this judgment was also too severe, for Peter was no mere compiler, but something of an experimental astronomer as well as a painstaking and critical translator, voluminous commentator upon Aristotle, and great medical authority. In the *Conciliator* he makes several references to his personal astronomical observations and to other treatises which he has composed upon astronomical topics and which are at least in part extant. He did not hesitate to correct the astronomical calculations of Ptolemy, and appreciated the margin of error in astronomical observations caused by variations in the construction of instruments as well as in their employment by the human observer.[1] His *Lucidator,* we have seen, was intended to parallel in the field of astronomy and astrology the achievement of the *Conciliator* in that of medicine; but the portion completed or extant is not a great addition to Peter's science, since it covers about the same ground already discussed in portions of the *Conciliator* and more especially in the treatise on the motion of the eighth sphere.

The *Conciliator* his masterpiece.

The *Conciliator* therefore remains his chief work and the one for which he is most famous, his masterpiece and most influential writing. Like the *Opus Maius* of Roger Bacon, it to a large extent covers his views as expressed elsewhere and is representative of his philosophy and learning as a whole. It is in many ways a valuable historical document, providing a good example of scholastic method, a broad picture of the state of medieval medicine, and much incidental illustration of the more general knowledge of Peter's times, as when he alludes to the overland travelers and to the ocean voyages of the thirteenth century. He learned from Marco Polo that there was human life in the Antipodes, he cites a letter of John of Monte Corvino from India "in the coasts where lies the body of the Apostle Thomas," he alludes to the attempt of two Genoese galleys to reach India by sea "almost thirty years ago" [1]—two centuries before Vasco da Gama and Columbus. The *Conciliator* does not, however, quite cover the entire field of medieval science. The subjects of "geometry and perspective," for instance, Peter rather avoids, explaining, "The arguments taken from the books of geometricians and students of perspective, such as Euclid, Alhazen, and others, and marked out by letters of the alphabet, I omit because most of those for whom I am writing are unfamiliar with that sort of thing." [2]

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[1] See his treatise on the motion of the eighth sphere, *Distinctio II,* cap. 3, in Canon. Misc. 190, fol. 80r.

Its method.

The *Conciliator* is made up of over two hundred questions or "Differences" which Peter and his associates have been investigating publicly for the past ten years. Each problem is stated and any doubtful terminology is explained; the utterances of past authorities anent the question are reviewed; the true solution is then reached and the reasons for it given; fourth and finally, hostile objections are answered. This rigid scheme of argumentation does not, however, prevent Peter from indulging in a deal of rather rambling digression. This makes a very long volume, especially as supplementary questions or corollaries are added to some of the two hundred odd *Differentiae*. Also it is, like most works in scholastic form, hard and tiresome reading, as one has to keep in mind all the authorities and objections which Peter has cited and raised until he finally gets around to answering them. Many of the questions concern purely medical matters and admit little debate between philosophers and physicians. The first ten, however, deal with general questions such as whether medicine is a science, whether a doctor ought to be a logician, whether the human body is amenable to medicine, and whether the physician can help the sick by a knowledge of astronomy. Nearly a hundred distinctions are then concerned with medical theory concerning the elements, the physical constitution, generation, the members of the human body, fevers, and kindred questions. The last odd hundred distinctions deal with matters of medical practice and personal hygiene.

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[1] Diff. 67.

[2] Diff. 64.

Specimens of its questions.

The mere list of these questions is interesting and illuminating, and a few of them may be reproduced here to show the kind of questions then debated by doctors—some of them are identical with the questions put by Petrus Hispanus in his *Commentary on the Diets of Isaac*—and to illustrate the broader scientific and philosophical interests of Peter's volume and time.

11. Is the number of the elements four or otherwise?
14. Has air weight in its own sphere?
23. Is the brain of hot or moist complexion?
28. Is manhood hotter than childhood or youth?
30. Does blood alone nourish?
42. Is the flesh or the heart the organ of touch?[1]
52. Does the marrow nourish the bones?
57. Is vital virtue something different from natural and animal virtue?
66. Is spring temperate?
67. Is life possible below the equator?
69. Is the white of an egg hot and the yolk cold?
70. (Supplement). Is wine good for children?
72. Is there a mean between health and sickness?
77. Is pain felt?

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[1] In Diff. 1 Peter had held that "the regulative power of the body resides in the brain," and in Diff. 18 that "the brain is the seat of sensation and motion":—"Virtus corporis regitiva habitaculum habet in cerebro" and "Cerebrum est fundamentum sensuum et motuum," cited by Colle (1825) III, 144-5, in a list of what he considered Peter's notable contributions to natural science.

79. Is a small head a better sign than a large one?
80. Are the arteries dilated when the heart is and constricted also when it is?
81. Is there attraction exercised when the arteries dilate and a loosening when they are constricted?
83. Is musical consonance found in the pulse?
101. Can a worm be generated in the belly?
103. (Supplement). Is death more likely to occur by day or night?
110. (Supplement). Are eggs beneficial in fevers?
114. Does the air alter us more than food or drink does?
115. Is life shortened more in autumn than other seasons?
118. (Supplement). Should one take exercise before or after meals?
119. Should heavy food be taken before light?
120. Should one eat once, twice, or several times a day?
121. Should dinner be at noon or night?[1]
122. Should one drink on top of fruit?
123. Should one sleep on the right or left side?
135. Does confidence of the patient in the doctor assist the cure?
153. Is every cure by contrary?
154. Should treatment begin with strong or weak medicine?
157. Does sleep help the cure?
171. Is cold water good in fevers?
182. (Supplement). Can fever coincide with apoplexy?
183. Is paralysis of the right side harder to cure than that of the left?
193. Can consumption be cured?
194. Does milk agree with consumptives?
204. Is a narcotic good for colic?
206. Is blood-letting from the left hand a proper treatment for gout in the right foot?

Peter has often been called a disciple of Averroes and

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[1] *An prandium cena debeat esse maius?*

Was Peter the founder of Averroism at Padua?

the founder of Averroism in Italy at Padua,[1] but I have noticed little in his works to substantiate this. Renan admits that Peter knew neither the *Colliget* nor the medical works of Averroes, while the doctrine of religious change according to astrological conjunctions which he takes as a sign of Averroism[2] in Peter came of course from much earlier Arabian astrologers. Indeed, it would seem that most of the points of view which are loosely designated by the word "Averroism" had been common enough among earlier Arabic writers and had even in considerable measure been taken from other sources than Averroes himself by the Latin world. Only if we accept the very dubious and loose assertion of Renan that "medicine, Arabism, Averroism, astrology, incredulity, became almost synonymous terms,"[3] can we connect Peter of Abano with Averroism and even then we have the obstacles that Peter often makes profession of Christian faith and that Steinschneider asserts that he made no translations from the Arabic.[4] And if astrological medicine be Averroistic, Peter was certainly not the first Averroist in Italy.

Reputation for magic.

Along with his reputation among the learned as a medical authority Peter acquired a popular reputation as a magician and nigromancer. This reputation had become established by the middle of the fifteenth century, when Michael Savonarola tells us that Peter's great knowledge of astronomy enabled him to make such predictions that men thought he employed magic, and that the present tradition among his fellow townsmen is that Abano was most skilled in the magic art. Of Peter's astrological skill Savonarola tells the story that, noting the approach of an unusually favorable constellation, he advised the immediate building of a new Padua in order to make her the queen of all cities. Similarly Scardeone ascribed to Peter the idea of the numerous astrological pictures illustrating the influence of the planets and signs upon terrestrial life with which the ceiling of the Palazzo della Ragione at Padua is adorned.[1] A different story and on the whole perhaps the most incredible one is told by Benvenuto of Imola,[2] perhaps seventy years after Peter's death. About to die, Peter said that his life had been especially devoted to three noble sciences, of which one, philosophy, made him subtle; the second, medicine, made him rich; and the third, astrology, made him a liar.

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[1] This can perhaps be traced back to a passage in Tiraboschi (1775) V, 147, "*Il primo ch'io sappia a commendare tra gli Italiani le opere di Averroe e a farne uso scrivendo fu Pietro d'Abano che nel suo Conciliatore assai spesso lo vien citando or sotto il vero suo nome or sotto quello per eccellenza adettatogli di Comentatore.*" Renan (see note 2) has already pointed out that Peter was not the first Italian to cite Averroes.

[2] E. Renan, *Averroès et L'Averroïsme*, fifth edition, pp. 326-7. Yet Renan admits that Averroes was then regarded as an opponent of astrology. We shall see, however, that Peter cites Averroes for the association of seven spirits with the planets, a point not noted by Renan.

[3] *Ibid.*, p. 327.

[4] Steinschneider (1905), pp. 58-9.

But to return to Peter's reputation as a magician. Savonarola, whom we were quoting and who evidently has a favorable opinion of magic, continues, "Moreover, this helps to round out his teaching, nor is it contrary to his other sciences, but makes the man the more illustrious." Naudé,[3] on the contrary, endeavored to exculpate Peter from the charge of magic and regarded "the common opinion of almost all authors" that he "was the greatest magician of his age and learned the seven liberal arts from seven familiar spirits whom he held captive in a crystal," as a legend developed from Peter's astrological predictions and from his own statements concerning incantations in the 156th *Differentia* of the *Conciliator*. As for the story of seven familiar spirits, already before Naudé Giovan Francesco Pico[4] had noted the incongruity between the universal reputation of Peter of Abano as a magician and the doctrine attributed to him that there are no demons. Among the authors whom Naudé had in mind was doubtless the learned Bodin who in the sixteenth century declared that Peter of Abano was proved to have been easily the chief of Italy's magicians. Naudé admitted that Peter had left treatises in physiognomy, geomancy, and chiromancy, but held that he had then abandoned "the idle curiosity of his youth to devote himself wholly to philosophy, medicine, and astrology." [1] We have already stated that Champier's criticisms of Peter's teachings largely related to astrology and magic. Let us now turn to Peter's own works and see what his attitude in regard to such matters really was.

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[1] The paintings do not seem to have been executed until about 1400.

[2] Muratori, *Antiquitates Italicae*, III, 374-5.

[3] Naudé (1625), pp. 381-91.

[4] *De rerum praenotione*, VII, 7, cited by Mazzuchelli (1741), p. xxvii.

Summary of occult science in the *Conciliator.*

In the *Conciliator,* as in most of his writings, Peter manifests a marked weakness for astrology and an extensive familiarity with that art. His penchant displays itself in the very prologue where he mentions "the power of genesis in the stars" (*vim geneseos sydeream*) in stating that most men are slaves not only in body but also in the nature of their minds. Peter also occasionally displays a credulous interest in dreams, fascination, incantations, and other varieties of magic. The sections of the *Conciliator* in which he has most to say of such matters are as follows. In the ninth Difference, "Whether human nature is weakened from what it was of old?" he appeals to astronomy and astrology for support of his views and digresses to speak of his own astronomical researches and publications and of the influence of the stars. The tenth *Differentia,* "Whether a doctor to-day can help the sick by his knowledge of astronomy?" discusses at considerable length the arguments against the art of astrology and argues in favor of astrological medicine. Question one hundred and thirteen, "Whether natural death can be retarded by any benefit?" involves further astrological discussion. In Difference one hundred and fifty-six the efficacy of incantations in medicine is considered. We shall have occasion, however, to cite many other *Differentiae* than these four.

Definition of astronomy and astrology.

By Peter's time the words "astronomy" and "astrology" were beginning to be used in about their present meaning. He is at pains to explain that their derivation from the similar Greek words, *nomos* and *logos,* does not justify this distinction. But he accepts the division of the science of the heavens into two parts, one descriptive and dealing with the measurement and motion of the stars, the other judicial and studying their effects. This latter is subdivided as usual into the branches of revolutions, nativities, interrogations, and elections, which last includes the science of images. Conjunctions go with revolutions.

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[1] Naudé (1625), pp. 380-1.

Nature controlled by the stars.

In the tenth *Differentia* of the *Conciliator* Peter lists and replies to a number of arguments against the art of astrology, such as that the distances involved are too great, the number of stars too numerous, their influences too diverse and conflicting, the instant of nativity too minute, to admit of accurate calculation and prediction. These objections remind us of those raised by Sextus Empiricus. Against such objections Peter adduces not only arguments of his own, but the opinions of philosophers, astrologers, and physicians. All wise men agree, he says, that aside from God, the celestial bodies are the first causes of happenings in this world. Aristotle and the Commentator,[1] indeed, hold that God does not act directly upon our lower world, and that all operations here are through mediums and instruments; but the true Christian Faith contends that the Creator can, if He will, affect His creatures "immediately and without motion and alteration." [2] Of the general law, however, that the natural world is universally controlled by the heavenly bodies there can be no doubt in Peter's opinion. In another chapter [3] he cites in favor of this view the assertion of Hermes, Enoch, or Mercury that each sand of the sea has its star influencing it, and that of the *Centiloquium* ascribed to Ptolemy that the face of this world is subject to the face of the heavens.

Astrology a science.

The only question is, how far are we able to follow the workings of this general law in individual cases? The perfect astrologer would require a thorough acquaintance with all the infinite detail of nature and the powers of mind and body. Often therefore astrologers can only approximately and not precisely predict what the stars signify. But the science of astrology should not be abused because certain men who call themselves astrologers or physicians but are really diviners and liars err in their judgments. But astrology proper is neither deceitful nor idle, and the astrologer "speaks the truth in most cases and very rarely fails of correct prognostication except in certain particulars." [1] Peter's confidence in astrology despite the complexity of the problems involved reminds one a little of the confidence of the political or social scientist of the present in his methods compared to those of the mere politician or indiscriminate philanthropist.

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[1] If this means Averroes, it will be noted that Peter does not sustain him against the Christian Faith.

[2] This passage is from Diff. 135.

[3] Diff. 101.

And not magic.

Again in the first *Differentia* of the *Lucidator* Peter argues the question whether astronomy or astrology is a science and meets various arguments raised against the study of the stars.[2] He holds that, while difficult and laborious, it is noble and honorable, a beautiful discipline adapted to the loftiest intellects, an entirely lawful and licit science. Like Michael Scot, Peter lists and defines various other arts of divination and magic in order to show that the science of the stars is in no way superstitious, as some of them are, and that it neither conjures spirits nor employs exorcisms and suffumigations, as do some arts of divination which try to justify themselves by claiming a connection with the highly reputable science of the stars. Like Guido Bonatti, Peter characterizes as "hypocrites" those who under pretense of defending God's prerogatives attack judicial astrology as derogating from divine majesty and involving necessity and compulsion. Those who detest such a science should rather be detested themselves, he says, together with those vulgar deceivers and charlatans whom they mistake for astrologers.

Occult virtues from the stars.

Indeed, if the perfect astrologer should know nature and man thoroughly, it is also true in Peter's opinion that astrology helps one to solve the problems of natural science. 'We see," he writes,[3] "that precious stones and medicines

[1] Diff. 113.
[2] BN 2598, fols. 99-107.
[3] Diff. 60.

have marvelous and occult virtues which cannot come from the qualities and natures of the elements (constituting them), since nothing acts beyond its species and every agent produces an effect in matter commensurate with itself." It is useless to try to argue *a priori* from the qualities of the constituent elements what these occult properties of particular objects will be; they can be investigated only by experience. And it seems evident to Peter that they can be accounted for only as products of the influence of the stars. Indeed, the same species of plant, grown under a different quarter of the heavens, may acquire new virtues. All inferior objects, he affirms in another chapter,[1] are filled by the action of those superior bodies with demoniac functions and virtues, so that Aristotle in *De coelo et mundo* says that some of the ancients held that all these objects are full of gods. An indeed suggestive passage from Aristotle, and more so than Peter of Abano or the Stagirite himself realized, tracing back the conception of occult virtue to its origin in fetishism and animism, whence too the gods sprang!

Astrological medicine.

Peter was convinced that a knowledge of astronomy and astrology was not only valuable but necessary in the practice of medicine. "Those who pursue medicine as they should and who industriously study the writings of their predecessors, these grant that this science of astronomy is not only useful but absolutely essential to medicine." [2] Peter cites Hippocrates and Haly in his support and advises the medical practitioner to look up the nativity of the patient, or, if this is impracticable, to address an interrogation on the case to an astrologer. By astronomy one can also foretell changes in the weather and regulate the treatment of the case accordingly. Diet and drink, purgatives and drugs, should all be administered with due regard to the constellations. Two *Differentiae* [3] of the *Conciliator* discuss at length the theme of critical days and their relation to the phases of the moon, which planet, as Peter more than once explains, is assumed to represent the influence of all the others, while to it is especially delegated the control of generation and corruption. The doctor should therefore keep his eye especially upon the moon, a point further emphasized in the pseudo-Hippocratic treatise of astrological medicine which Peter is said to have translated. In still another chapter of the *Conciliator*[1] the question at issue is whether blood-letting is preferable in the first or some other quarter of the moon. Surgeons, too, should not operate when the stars are unpropitious and should note the apportionment of the members of the human body among the signs of the zodiac. When the patient's symptoms are ambiguous, the perplexed doctor may bridge the gap in his medical prognostication by recourse to astrology. This will tend to increase his reputation with his patients who will marvel at his power of prognostication. While thus discussing his tenth question, whether a doctor should know astronomy, Peter adds that astrology is useful in metaphysics as well as in medicine, giving as an example the fact that Aristotle appeals to astrologers at one point of his *Metaphysics*.

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[1] Diff. 101.

[2] Diff. 10; see also Diff. 113.

[3] 104 and 105.

The stars and length of life.

Peter more than once touches upon the influence of the stars upon the length of human life: in Difference 9, for example, where he is inquiring whether men lived longer in ancient times than in his own day; in Difference 21, where the point at issue is whether a temperate "complexion" is more conducive to longevity, and where he indulges in considerable detail about the control of the planets over the process of generation; and in Difference 113, where the question is whether there is any way of putting off natural death. According to the astrologers, one hundred and twenty years—the length of a greater solar year—was the natural term of life, a considerable reduction from the age of the patriarchs of the Old Testament, but much longer than most men lived in Peter's time. He thinks that the people of India live longer because their climate is subject to Saturn.

[1] Diff. 168.

In Difference 26 Peter divides the life of man into seven ages under the seven planets.

Nativities.

It is clear from many passages in the *Conciliator* that Peter believes that much of a man's life and character can be inferred from his horoscope. The geniture of a prince may involve the slaughter of vast multitudes in war, although their own horoscopes may not have definitely indicated this fate for them but only a certain inclination in that direction.[1] Peter devotes considerable space and pains to the process of generation and the problem of measuring the time of nativity. He gives physiological explanations why twins, even before birth, are not under the same astrological influence and approvingly quotes the lines of Lucan:[2]

> *Stant gemini fratres fecundae gloria matris*
> *Quos eadem variis genuerunt viscera fatis.*

Revolution of the eighth sphere.

In connection with the subdivision of judicial astrology known as revolutions Peter was especially interested in the motion of the eighth sphere of the fixed stars, concerning which we have seen he wrote a distinct treatise[3] and of which he treats in both the *Lucidator*[4] and *Conciliator*.[5] Ptolemy had reckoned that the sphere of the fixed stars moved one degree in a hundred years and that consequently the eighth sphere made a complete revolution every 36,000 years. Albategni's estimate was 23,760 years for a complete revolution or a motion of one degree in the course of sixty-six years. Peter's own calculation was that one degree was accomplished in seventy years. He regarded this as a matter of great importance because of the vast changes which he believed the revolution of the eighth sphere brought about. Its influence could even change dry land into sea, as the story of the lost island of Atlantis showed. Peter mentions the doctrine of the *magnus annus*, held by "certain Stoics and Pythagoreans" that history would repeat itself as soon as the eighth sphere had accomplished a complete revolution. His own favorite theory, set forth three times in the aforesaid three works, was that when the heads of the equinoctial and tropical signs of the mobile zodiac come directly under the heads of the same signs of the immobile zodiac in the heaven of the fixed stars, then virtue from the First Cause passes in a more perfect manner through the mediate causes or heavens and men live longer and are stronger. For some five hundred years before and after the period of exact coincidence a golden age occurs, men of genius appear in large numbers, and the world tends to unite under one government. Such a period in Peter's opinion was that of classical antiquity, when there were great rulers like Darius, Alexander, and Julius Caesar; great minds like Hippocrates, Plato, Aristotle, Stoics and Peripatetics, Euclid, Abrachys, Ptolemy, Galen, Cicero, and Vergil; and when both the Roman law and the Christian religion were promulgated. But then gradually, as the discrepancy between the mobile and immobile signs increases, all is changed to the contrary, human nature deteriorates, the span of life is shortened, monarchy is corrupted, faith and law are made light of, the people are oppressed, and true sages are rare indeed.

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[1] Diff. 64.

[2] Diff. 23.

[3] Canon. Misc. 190, fols. 78r-83r.

[4] Diff. 2, BN 2598, fol. 109v.

[5] Diff. 9 and 18.

Conjunctions.

In a number of places in the *Conciliator* Peter discusses the subject of the effects of conjunctions of the planets. He states[1] that very rarely at long intervals of time, when a greatest conjunction of Saturn and Jupiter occurs in the beginning of the sign of the ram, a well-balanced type of constitution [2] is produced, but never more than a single specimen at one time. Such a man becomes "a prophet, introducing a new law or religion, and teaching sages and men." Such a man, according to Isaac Amaraan, Avicenna, and Algazetes, is midway between angels and sages, and some say that Moses and Christ were such men. Peter also hints at a coincidence between the length of time that astrology teaches that such a perfectly proportioned physical constitution will last and the duration of Christ's life. Champier included this passage in his list of Peter's errors. Champier further attacked the astrological doctrine of great conjunctions and censured Peter for connecting Noah's flood and the advent of Mohammed with them. In another passage [1] concerning this same conjunction of Saturn and Jupiter in the first degree of *Aries* [2] Peter asserted that it not only altered the strength of human nature and affected the length of life but produced new kingdoms and religions, as in the case of the respective advents of Moses, Nebuchadnezzar, Alexander the Great, Christ, and Mohammed.

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[1] Diff. 18.

[2] "Complexio temperata."

The astrological interpretation of history.

This astrological interpretation of history Peter carries out in further detail. As he had divided man's life into seven ages, so he distributed periods of history among the seven planets. Each presides in turn over human affairs for a period of 354 years and four lunar months, a term analogous to the number of days in the lunar year. When Mars governed the world, the flood occurred because of a greatest conjunction of the planets in the sign *Pisces*. Under the Moon's supremacy happened the dispersion of tongues, overthrow of Sodom and Gomorrah, and escape of the children of Israel from Egypt. Peter also alludes to the less significant minor conjunctions which happen every twenty years, to the moderate ones which take place every 240 or 260 years, and to the effects following eclipses. A solar eclipse seventy years ago, he says, was followed by sterility of the soil, movements of phantasms and of good demons and bad demons, intercourse of incubi and succubi, a weakening of human nature and increase of avarice and cupidity.

Chronology.

The chronology of some of Peter's astrological periods of history has been sharply criticized. Thus Lea remarks, "Even worse was his Averrhoistic indifference to religion manifested in the statement that the conjunction of Saturn and Jupiter in the head of Aries, which occurs every 960 years, causes change in the monarchies and religions of the world as appears in the advent of Moses, Nebuchadnezzar,

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[1] Diff. 9.

[2] Peter thus is the precursor of recent writers in preferring a conjunction in Aries to one in Pisces as the sign of the Messiah: see chapter 20, I, 473.

Alexander the Great, Christ, and Mahomet—a speculation whose infidelity was even worse than its chronology."[1] The printed editions of the *Conciliator* which I have consulted also give the time as 960 years, but it would seem as if the figure must have been wrongly copied in or from the manuscripts, since in the *Lucidator,*[2] which I have examined in manuscript, Peter shows acquaintance with different systems of chronology, stating, for example, that Ptolemy and Galen flourished under Antoninus Pius in the year 886 of the era of Nebuchadnezzar or in 141 A. D. Peter therefore would appear to have known perfectly well that no such period as 960 years had elapsed between the time of Nebuchadnezzar and Christ, to say nothing of Alexander and Christ. In another passage of the *Conciliator,*[3] moreover, Peter explains that conjunctions may precede by many years the events which they signify and produce but which are long in the making. Thus the conjunction for the flood preceded it by 287 years and the conjunction connected with Mohammed came fifty years before him, as Albumasar and Alchabitius state. In his treatise on the eighth sphere Peter stated that his theory of its motion and influence holds good independently of the question whether the world is eternal, as all the philosophers except Plato held, or had a beginning and when that beginning was. He gives, however, a list of various estimates of the number of years since creation, such as Bede's estimate of 5259; Abraham Judaeus' of 5071; the Septuagint, 7270; Josephus, 5262; and so on up to the enormous figure of 1,474,346,290 years given by the Indians and Persians.[4]

Astrological images.

Peter believed not only that astrologers could predict the future with considerable assurance of success, but also that they could influence the future to suit themselves and perhaps change threatening misfortune into good fortune by applying to earthly objects the occult virtue of the heavenly bodies. The way to capture and store up such celestial influence is by means of images made by human art with due reference to the constellations. Of such astrological images Peter speaks frequently in the *Conciliator.*[1] Physicians are advised to construct such images at the proper time when "the vivifying and health-exciting celestial light" will flow freely into them, as is illustrated by the astronomical images of Ptolemy, Thebith ben Chorat, and others. The figure of a scorpion made as the moon is leaving the sign of the scorpion cures that reptile's bite.[2] Human life can be prolonged by such images which add to the influx of astral force received at birth.[3] On the other hand, Peter elsewhere states the theory that the impulse to construct an image was received at birth from the stars,[4] and so does not really alter their influence. He usually, however, speaks as if the employment of images was a matter of choice. They are more often made by night than by day, so that the rays of the sun may not obscure and dissolve those of the other heavenly bodies.[5] The astronomers of India employ allegorical images.[6] Peter himself "has tested to remove pain in the intestines the figure of a lion impressed on gold when the sun was in mid-sky, with the heart of a lion, when Jupiter or Venus was in aspect and the evil unfortunate stars were declining." He bound this amulet "on the bare flesh with a string made of sea calf's hide and a clasp from the bone of a male whale." [7] What could be more magical? In another passage Peter notes that theologians attribute the efficacy of such images to demons, but he sets aside this suggestion as not in accord with his present method, which apparently takes into account only natural and not spiritual forces, although he suggests that the celestial light and force may be regarded as the instruments of intelligences.[8] In the *Lucidator* Peter makes much the same distinction between astronomical and necromantic images as Albertus Magnus had made in the *Speculum astronomiae*. Notes by Peter on astrological images are contained in the *Astrolabium planum*, published in 1488.[1]

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[1] H. C. Lea, *A History of the Inquisition of the Middle Ages,* III, 440.

[2] Diff. 2, BN 2598, fol. 109r.

[3] Diff. 113.

[4] Canon. Misc. 190, fol. 83r. Some of the figures may very likely have been miscopied by the writer of the MS.

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[1] See Diff. 9, 10, 16, 64, 101, 113.

[2] Diff. 10.

[3] Diff. 113.

[4] Diff. 64.

[5] *Idem.*

[6] Diff. 9.

[7] Diff. 10.

[8] Diff. 64.

The stars and invocations, incantations, and fascination.

Peter refers twice in the *Conciliator* [2] to his success with an invocation to God to acquire knowledge, when the head of the dragon and Jupiter were together in mid-sky and the moon was approaching them. He also cites *Albumasar in Sadam* for a similar practice by "the kings of the Greeks," when they wished to ask God for anything. Elsewhere [3] he states that the defenders of fascination and incantations aver that their potency consists in the virtue which the soul of the operator receives from the stars, just as an image receives their motion and light. The horoscope of the person uttering the invocation is a factor of some importance, but not the preponderating influence.[4] Not a few of the Magi invoke Jupiter, Saturn, or another heavenly body by the name of the intelligence which guides it.[5]

Stars and spirits.

This last passage and one or two others already cited show that Peter was inclined to associate spirits and intelligences with the heavenly bodies. Once he describes a celestial body as "perpetual and incorruptible, leading through all eternity a life most sufficient unto itself, nor ever growing old." In the same chapter [6] he tells us that when Aristotle wished to investigate the number of Intelligences, he betook himself to two famous astrologers and according to the number of spheres as stated by them calculated the number of Intelligences. In the preceding chapter [7] he had repeated from Averroes the following association of seven intelligences or angels with the planets: Saturn and Cassiel, Jupiter and Sachiel, Mars and Samael, the Sun and Michael, Venus and Anael, Mercury and Raphael, the Moon and Gabriel.

This passage and Peter's invocation are a dangerously close approach to astrological necromancy. Enough so per-

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[1] *Firmicus Maternus*, ed. Kroll et Skutsch, II (1913), p. xxxii.

[2] Diff. 113 and 156.

[3] Diff. 135.

[4] Diff. 64 and 156.

[5] Diff. 9 and 156.

[6] Diff. 10.

[7] Diff. 9.

Were Peter's views heretical?

haps to justify the reproach which Champier repeated from some "recent authority" that Peter borrowed a great deal from Picatrix, "a very idle book full of superstitious prayers to planets and evil spirits." Champier, however, cited no specific passages to substantiate this charge, and I doubt if it can be shown that the *Conciliator* either cites or makes unacknowledged quotation from Picatrix. It will also be observed that Peter does not assert that the stars themselves are spirits or intelligences or gods, and that both Aquinas and Albert were inclined to agree that angels or heavenly intelligences moved the stars. That Peter's views were objectionable to some persons, however, is indicated by the closing passage of this ninth *Differentia,* in which he has associated seven spirits with the planets, the rise of prophets and new religions with great conjunctions, and activity of demons with solar eclipses. Some malicious persons have long troubled him, he says, but his utterances in nothing derogate from divine wisdom but rather confirm it, and at last an apostolic mandate has snatched him and his truth from the hands of his detractors. In other words, the pope has protected him. Peter's astrology sometimes seems to show scant regard for human free will, but he recognized it as an essential Christian doctrine.[1]

Fascination.

Peter alludes several times [2] to the subject of fascination in connection with images and incantations. It seems evident that he is here trying to account among other things for hypnotic power. In the *Lucidator* he defines *maleficium,* the usual word for sorcery, as a sort of fascination, "taking possession of one's powers so that one loses self-control," and "impeding sexual intercourse." [3] In opposing the theory that vision is by extramission of rays Peter explains the deadly glance of the basilisk as due to corrupting vapor and not to visual rays, and fascination as caused by some more occult force than the evil eye in a literal sense.[1] And when arguing that the confidence of the patient in the doctor is a factor in the cure Peter emphasizes the power of a strong will impressed in an occult fashion.[2] Some men, it is true, like the followers of Asclepius, deny any virtue of the mind and regard their fellow-men as swayed like beasts by the passions of the senses, deeming wisdom, sobriety and continence a jest, calling human affection and altruism into question, and further despising dreams, divinations, prudent counsels and the whole subject of astrology. But Peter believes in the power of one mind over another or over matter. Such a mind can cure the sick or even cast a man into a well or cause a camel to enter a Turkish bath (*caldarium*). It is also one of the causes of prophetic power. The believers in fascination and incantations say that such marvelous virtues of the mind are derived from the stars. But Christians regard prophetic power as directly inspired by God, an opinion which seems ridiculous to the Peripatetics.

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[1] *De motu octave spere,* IV, 2, in Canon. Misc. 190, fol. 83r, "ut veritas fidei credere nos compellit cum agens liberius potentiam habeat super materiam omnifariam."

[2] *Conciliator,* Diff. 64, 113, 135.

[3] BN 2598, fol. 101v, "fascinatio animalis occupans vires ut sui compos esse non valeat, actum venereum impediens." It is hard to say if *animalis* should be translated "animal" or "of the soul."

Incantations.

In much the same way Peter discusses incantations.[3] He lists several definitions of an incantation, such as that ascribed to Socrates, "words deceiving human minds," or "an utterance put forth with astounding influence in aid of an enchanted person who is especially confiding," or "an utterance at discretion of meaningless words, which since it has to do with the strange and occult is esteemed the more by the person enchanted and so helps him the more." An incantation may be either spoken, or written and bound on the body. The enchanter should be astute, credulous, and strong-willed; the person enchanted should be eager, hopeful, and disposed in every way to forward the success of the operation. Incantations are especially effective in sleep or in the case of women and simple folk who have the more faith in them. Peter tells an amusing anecdote of a noble who taught a poor old woman to repeat as an incantation the sentence, "Two and three make five and so do three and two." He thought her a witch, however, and when a fish bone stuck fast in his throat, sent for her to remove it. When he found that she really knew no magic except the absurd incantation which he had himself taught her, he laughed so heartily that the bone was dislodged and he was thus cured by his own incantation after all.

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[1] *Conciliator*, Diff. 64.

[2] *Ibid.*, Diff. 135, "confidentia est intentio vehementer apprehensioni occulte impressa."

[3] *Ibid.*, Diff. 156.

All this sounds rather sceptical on Peter's part, and he also recalls Galen's detestation of certain medical authors who wrote down superstitious words and fables such as old-wives and witches are wont to repeat and stupid gypsies who utter fascinations. "For they conjured and sprinkled and suffumigated medicines as if divine, when they plucked the herbs from the soil or when they suspended them about the neck or elsewhere like a phylactery, all which is false and stupid and offensive to the art of medicine." But while Peter joins in condemnation of such superstitious medicine, he yet believes in the efficacy of incantations and represents their opponents as incredulous and materialistic persons who will accept only action by gross material contact. He admits that there is no property in the incantation itself nor in its sound when uttered to explain its marvelous effects. We must look rather to the virtue of the mind of the person repeating the charm, to faith on the part of the person to be benefited, and to divine, angelic, demonic, or sidereal assistance. At any rate experience demonstrates the validity of incantations and spoken words, as in the case of the Eucharist, or of the divine names employed in the notory art, or the restoration to life of a dead man which was performed in Peter's presence by magic words which the enchanter uttered in the ear of the corpse. Peter goes on to speak of the movement of the holy wafer or Psalter or sieve towards a thief who enters a church. Other wonders wrought by incantations which he lists are the ability to endure torture without giving signs of pain or to walk over sharp swords and hot coals without injury, to lift another man or raise a great weight with a single finger, to stupefy snakes and tame wild horses, cause insomnia, reveal the future, painlessly extract arrows that are so deeply embedded in the bone that they could not be pulled out. Paroxysms of epilepsy may be quieted by pronouncing the names of the three Magi in the patient's ear. Peter also repeats the cure for epilepsy found in so many medieval authors and involving religious ceremonial and repetition of a verse from the Bible. Anent Peter's allusion to the employment of divine names in the notory art, we may note that a work on that subject is listed among evil books in his *Lucidator.*[1]

Number mysticism.

The superstitious esteem for certain numbers which prevailed both in ancient and medieval times does not pass unnoticed in the *Conciliator.* Arguing the question whether the child born in the eighth month will live,[2] Peter discusses the subject of perfect and imperfect numbers for three columns, stating that this is the doctrine of Pythagoras and of arithmeticians in general. In a later chapter,[3] however, he declares that natural phenomena cannot be proved by arithmetical numbers since they are not caused by them, and alludes to Aristotle's strictures upon Pythagoras.

Poisoning and magic.

Poisoning and magic were often scarcely distinguished in antiquity. The Greek word φάρμακον and the Latin *veneficium* or *veneficus* might have reference either to poisoning or sorcery, either to a poisoner or enchanter. Plato states in his *Laws* [4] that there are two kinds of poison employed by men which cannot be clearly distinguished, although one variety injures the body "according to natural law," while the other "persuades overbold men that they can work injury by sorceries and incantations." The Latin poet Lucan centuries later drew a sharper distinction when he declared, "The mind which is enchanted perishes without foul trace of poisoned draught," and this dictum we have found embodied in more than one medieval definition and description of magic. However, all magic is not enchantment; the poisoner and magician worked in the same secret and sinister style, sought similar injurious ends, and availed themselves of the same powerful occult virtues in natural objects. Poisoning and bewitching seemed very similar processes, especially at a time when men believed in the existence of poisons which could act at a distance or after a long interval of time. In one passage of the *Conciliator* [1] Peter uses the word *veneficus* rather in the sense of an enchanter or magician than a poisoner, when he says that, if you wish to injure another person or to make him love you, the *venefici* direct you to gaze fixedly at him at the same time uttering a certain incantation. But let us now turn to the treatise *De venenis,* in which Peter has much more to say on the subject of poisons.

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[1] BN 2598, fol. 101r, "ars dicta notaria fortunati."

[2] Diff. 49.

[3] Diff. 105.

[4] Book XI, p. 933 (Stephanus).

The treatise *De venenis.*

It will be recalled that Peter's treatise on poisons was written for the pope. The topics considered in its six main chapters are: the classification of poisons, how they act upon the body, how to guard against them, the effects and cures of a long list of particular poisons, and finally the problem of a panacea or *bezoar* against all poisons. Peter classifies poisons according as they come from animals, vegetables, or minerals, and as they take effect internally or externally. Those which take effect internally are usually administered in food or drink, or swallowed without admixture. But one may be poisoned externally not only by contact, as in the case of snake-bite, but through the sense of sight, as when the glance of the basilisk kills, and through the sense of hearing, as when the *regulus* [2] kills bird or beast by its hiss. In fact, poisoning may be through any one of the five senses. Some snake-bites Peter classifies under the sense of taste rather than touch. Other serpents emit a poisonous odor, or kill a person who touches them only with the tip of a long lance. The hands and arms of fishermen become paralyzed when they take hold of nets in which a certain fish has become entangled. These last are perhaps exaggerated accounts based upon electrical shock.

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[1] Diff. 64.

[2] A serpent of Nubia of the thickness of two fists, with a sharp-pointed head and of green color.

Specific form or valence.

Poisons may also be classified according to the form of their species (*forma specifica*). Some prove fatal owing to the excessive preponderance of one quality, being excessively hot or cold or moist or dry. Others are deadly because their entire composition, the very form of their species, is fatal. Peter then gives an interesting definition of this "specific form." "It is nothing else than the value or valence (*meritum*) which any object composed of the four elements acquires from the proportions of those elements existing in this compound and from the influence of the fixed stars which regard the species of inferior compounds." Through the light of the stars streaming down in straight lines pyramids of astral force concentrate upon terrestrial objects,—the same doctrine of stellar rays, emanation, and multiplication of species that we have met already in Alkindi, Grosseteste, and Roger Bacon. Peter adds that this specific form of any compound is not easy to discover except as human experience gradually reveals it empirically, "because we do not know and we never shall know the quantities and the weights of the elements in the compounds." That is to say, Peter sees the desirability but despairs of the possibility of any such discovery as that of atomic weights and valences, and consequently of a true science of chemistry. His despair is not surprising in view of the fact that medieval men were still trying to conduct their scientific researches upon the outworn Greek hypothesis of only four elements, earth, air, fire, and water, all of which are really compounds and indeed in the middle ages were not supposed to be ever found in their pure state. Desperation like Peter's was needed before science could be induced to take a fresh start, and, like Arnald of Villanova, he is to be given credit for an approach to the chemical conception of valence.

An allusion to alchemy.

With the subject of alchemy, it may be remarked in passing, Peter appears to have had little to do, and not even any spurious treatises on the subject are extant under his name, as they are in the cases of Albertus Magnus, Thomas Aquinas, Roger Bacon, Arnald of Villanova, and Raymond Lull. Colle,[1] however, noted a passage in the *Conciliator*[2] where Peter speaks of two friends of his who had told him that they had succeeded "by the art of decoction" in making silver which was true to every examination but from which they had not profited much openly.

Mineral, vegetable, and animal poisons.

In his second chapter Peter discusses various mineral, vegetable, and animal poisons under the caption, "Of each poison in particular" (*De unoquoque veneno in speciali*). Quicksilver made by the art of alchemy he declares a more deadly poison than natural mercury. He is either an early advocate of inoculation and homeopathy, or else is guilty of silly reasoning based upon sympathetic magic, when he states that the magnet taken internally produces melancholy and lunacy and that doctors employ it with other medicines to cure melancholy. Incidentally he mentions two kinds of magnet, one which attracts iron toward the north pole, another which draws human flesh toward the south pole. Vegetable poisons may be the juices of herbs, the fruit of trees, or seeds. Some animals have poison in their brains; some, in their tails; some, in the blood; some, in the saliva and spittle; some, in the gall; and some, in their entire bodies.

How poison takes effect.

The question, how poison takes effect upon the human body, occasions Peter considerable difficulty, since he is unwilling to admit either that the heart naturally attracts poison or that poison runs naturally to the heart. Avicenna says that a man with a hot heart offers the best resistance to poison, but Peter adds that much depends upon the human soul and the constellations. He notes that the action of poison is very similar to that of medicine and thinks that the art of medicine was suggested by the action of poisons. Incidentally he repeats from his authorities statements that there are trees whose shade is poisonous to sleep in or to bathe beneath, and that a man was killed by the vapor from wood cut near the caverns of serpents which was used as fuel in heating his bath. He also repeats the tale of Socrates and the dragon.[1]

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[1] Colle (1824) III, 146.

[2] Diff. 178. "Et iam testificati sunt mihi duo amicorum fideles argentum arte decoctionis fecisse verum omni examine non tamen valde lucrari aperte."

Safeguards against poison.

The fourth chapter is concerned with safeguards against poison, which often take the form of amulets and charms and are, if anything, even closer akin to magic than the poisons themselves. There are the horns of a serpent which sweat at the advent of certain poisons but not of others. There is the gem that ceases to gleam in the presence of poison. There is the stone which Alexander wore in his belt until a jealous snake stole it while he was bathing in the Euphrates. There is the following image recommended in the book of the Persian kings—possibly the *Kiranides.* Engrave the gem Ematites with a kneeling man girded by a serpent whose head he holds in his right hand and tail in the left.[2] Set this stone in a gold ring and under the gem place a dried root of *serpentaria.* Either Peter or the author of the book of the Persian kings affirms that he wears such a ring and has been preserved from poisoning by it. An emerald is another good safeguard against poison. Peter perhaps has a confused recollection of a story told by Albertus Magnus [3] when he adds that it has been proved that a toad's eyes will crack if it gazes at an emerald. There are seven herbs, namely: Ipericon, "which Achilles is said to have found in the Trojan army by the oracle of Apollo," Vincetoxicum, Enula, Rafanus, Diptamus, Aristologia, and Lactucella, which will cure any poison. This virtue is not due to the elements composing them but to the force of the seven planets. Peter's antidotes are not all occult or talismanic. He also prescribes the more commonplace methods of a drink of butter and hot water to provoke vomiting, the use of a syringe to clear the intestines, the application of a relay of hot fowls to the wound, or the sucking of it "by the mouth of some slave or servant"—*sclavi vel servi,* an interesting bit of etymological evidence of the medieval transition from the Latin *servus* to the modern word "slave," and for the derivation of the latter from the Slavs who were sold in southern and western Europe. Peter also mentions the famous *terra sigillata* which, he says, causes vomiting if there is any poison in the stomach. Kings and princes in the west [1] take it with their meals as a safeguard, and it is called *terra sigillata* because stamped with the king's seal. Now, however, the seals are no longer trustworthy and Peter cautions the pope against what may be offered him as *terra sigillata.*[2] Over seventy brief chapters are next devoted to enumeration of the effects produced by as many poisons and how to remedy them. The poisons include the blood of a rubicund, choleric man, the bite of a fasting man, the gall of a leopard, and the salamander. Among the remedies are duck's fat and pulverized mouse dung. The remedies operate against the poison either by "breaking its sharpness," or "resolving its substance," or "expelling it," or "corrupting it and utterly taking away its virtue."

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[1] See above pp. 262-3.

[2] For a similar image mentioned by Arnald of Villanova see above, p. 858.

[3] See above p. 546.

The bezoar.

Finally Peter comes to the discussion of "bezoartic virtues" which free from death by occult and divine virtue rather than by their natural composition. Under this head he proposes to deal with two difficult questions: first, whether theriac is a bezoar (i. e., antidote or panacea) and medicine for every poison; second, whether there is any poison which can be set to act at a given time, so that the victim will die from it then and not before. In those copies of the *De venenis* which I have seen the discussion of this second question is never reached. Perhaps it was intended only for the pope's ear and not published. As for the former question, some believe in a bezoar or stone that frees from all poisons without medical assistance. Edward I of England, when wounded by the Sultan's poisoned sword, is said to have been cured by such a stone which "the general preceptor of the Temple gave him, and I have seen one like it." It is red, purulent, light as a sponge, and fragile as gypsum. But Peter inclines to believe that each poison has its own antidote which is the best cure for it. Like Galen, however, he extols that "divine and noble" artificial compound, theriac, a mixture of all the single medicines which break or dissolve or expel poisons. It may, he thinks, deservedly be called *Bezoar,* since it is good against all poisons, although for any particular poison there may be a superior particular remedy. After Peter's treatise has apparently ended with the words, *Deo gratias,* there is added a note from the Pandects concerning the stone *Begaar* or Bezoar, asserting its reality and superiority to any simple antidote or any of the compound theriacs.[1]

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[1] "De partibus occidentalibus"; this may be a slip of the copyist, or a careless retention by Peter of the wording of some Arabic writer.

[2] Addit. 37079, fol. 106r, "Nunc autem periit fides sigillorum. Nota bene. Quoniam tam illegalis quam allegans ad vos sigillata portatur."

Physiognomy.

Peter's treatise on physiognomy mentions Philemon, Aristotle, Palemon, and Loxius as the founders of the art, and Rasis, Zacharias, and Avicenna as Arabian authorities. Peter proposes to combine their separate contributions to the subject "into one lucid and perfect doctrine." The first draft intended for the captain-general of Mantua has got into "the hands of some rascal who scorns to communicate it to me or others." At the sollicitation of his friends and lest invidious detractors envying another's work gain glory from it, Peter has written another draft which he flatters himself is longer and better. "So praise be," he piously ejaculates, "to God, the better producer of everything, who from that evil has created this good and best!" Peter's treatise differs from other Physiognomies mainly in its emphasis upon astrology, to which its third book is largely devoted. He gives the influence of each sign and planet upon the physique and character of the person born under it, and discusses in considerable detail the process of generation, the influence of heredity as well as of the stars, and the effect upon the babe of any strong imagination, especially on the part of the mother, during the period of generation.

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[1] J. G. Frazer (1911) I, 305, gives some instances from Mongolia of use of "bezoar stones as instruments of rain" combined with incantations. Here "bezoar" is used in the sense of a stone found in the stomach or intestines of an animal.

Astrology in his other works.

Peter's penchant for astrology is further evidenced by his Latin version of the various astrological treatises of Abraham Aben Ezra, and his translation of the brief treatise attributed to Hippocrates on the prognostication of diseases according to the moon. Peter or some previous translator or editor opens it by saying that while reading the works of Hippocrates he found this book, "small but of great utility and very essential to all physicians. Whoever is well acquainted with it can pronounce health, death, or life in every infirmity." Peter brings in astrology even in his commentary on the Problems of Aristotle. When Aristotle mentions an astronomer or astrologer in a derogatory manner in the same breath with a juggler or mime or pipe-player or rhetorician, Peter is at pains to explain that in Aristotle's time the science of judicial astrology had not yet attained its present perfection.

Attitude to "magic."

In those of his works which are certainly genuine Peter seldom uses the word "magic" and never, I think, speaks of it approvingly, although Michael Savonarola could see no reason why he should not do so. Despite his reputation for magic, the longest discussion of such arts in his admittedly genuine works occurs in the *Lucidator,*[1] where, after the manner of Michael Scot and Albert in the *Speculum astronomiae,* he is chiefly concerned to distinguish astrology favorably from these other forms of divination and magic. With occasionally some additional detail he mainly repeats the old account of the origin of magic with Zoroaster or Cham, the son of Noah, and with Hermes or Enoch or Mercurius; and the old classification of the occult arts found in Isidore and Hugo of St. Victor.

Magic books ascribed to him.

Naudé states, on the authority of Castellan, that when Peter was burned in effigy after his death, the reading was forbidden of three superstitious and abominable books which he had composed, entitled respectively, *Heptameron, Eluci-*

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[1] Diff. 1.

darium Necromanticum, and *Liber experimentorum mirabilium de annulis secundum 28 mansiones lunae* (Book of marvelous experiments with rings according to the twenty-eight mansions of the moon).[1] Naudé adds, however, that Trithemius and Symphorien Champier could find no books on magic by Peter of Abano.[2] Such treatises, however, exist both in print and in manuscripts, which last are mainly of late date, and will be found listed in Appendix II. Prophecies ascribed to "the most reverend nigromancer, Peter of Abano," were printed in Bologna in Italian about 1495 and occur also in Latin in a Vatican manuscript. The printed *Heptameron* or *Elements of Magic* consists entirely of specific directions how to invoke demons, and if genuine, might account for Champier's charge that Peter borrowed from Picatrix. The reader is instructed in the construction of the magic circle, in the names of the angels, and concerning benedictions, fumigations, exorcisms, prayers to God, visions, apparitions, and conjurations for each day of the week. The work seems quite certainly spurious.

Geomancy.

It is more probable that Peter may have written a geomancy in view of his devotion to astrology and Naudé's statement that he had left treatises in "physiognomy, geomancy, and chiromancy." At any rate a geomancy exists under his name in several printed editions and manuscripts. In the *Conciliator* he asserted that the future and what was absent could be predicted by means of characters "as geomancy teaches." [3] In the *Lucidator* he concisely described the method of geomancy, and admitted that its figures were produced under the influence of the constellations and that not infrequently its judgments were verified, but he regarded it as a very difficult science of prediction and one requiring long experience and practice, although many persons tried their hand at it because it looked easy.[4]

Conclusion.

Such was the attitude of the learned and influential Peter of Abano at the close of the thirteenth and opening of the fourteenth century toward the subjects which we are investigating. We may well agree with Tomasini that he combined medicine and philosophy, astrology and natural magic, in the closest union. He amassed a great deal of the lore of the past, Greek, Arabic, and the writings of his Latin predecessors. Indeed, when he repeats what earlier Latin writers in the thirteenth century had said, just as they had repeated what the Arabs said, we rather begin to weary of the subjects under discussion and to feel that medieval Latin learning is growing stagnant or stereotyped. Pico della Mirandola spoke of Peter not only as "a man fitted by nature to collect rather than to digest," but also as one "whom alas the less learned are wont to admire most when he lies most." In other words, Peter's failings continued general for some time. The Latin epitaph which Tomasini in the seventeenth century drew up to accompany the portrait of Peter in his book on illustrious men, although containing one or two erroneous statements which we have already corrected, sums up rather well the salient points of both Peter's learning and occult science. It may be translated thus:

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[1] Naudé (1625), p. 381.

[2] *Ibid.*, p. 390.

[3] Diff. 156.

[4] Diff. 1.

"From a rural locality, of auspicious cognomen, a man most illustrious in genius, doctrine, and merits, in a rude and unhappy age became the most fortunate and learned physician. Now too he shines with rays eternal, investigator of all natural forces. He gave the secrets of the Greek tongue to the Latin idiom by his power of assiduous practice and constant reading. Employing the virtues of herbs and stones, the sure aspects of the sky, stated hours and moments, by the crowd he was reputed to fascinate men. He opened the arcana of the art medical; he reconciled conflicts, a wonderful warrior! The name of Conciliator he won by uniting medicine and philosophy, astrology and natural magic, in the closest bond. Born for study, he died studying. A. D. 1316, aged 66."[1]

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[1] Tomasini (1630), p. 22.

APPENDIX I

PREVIOUS ACCOUNTS OF PETER OF ABANO

Original sources.

As is usually the case with past authors and scholars, Peter of Abano's own works[1] are the best source concerning the events of his life as well as his learning and superstition. Another important document is his will, published by Verci, whose *History of the Trevisan Mark* includes some other documents bearing upon Peter's career.[2] Other contemporary source-material connected with Peter or members of his family has been noted by Gloria in his collection of material concerning the University of Padua,[3] or by even more recent investigators. Less valuable are the inscriptions, chiefly sepulchral or eulogistic, which older writers reported but whose dates are late or uncertain. In a MS of the fifteenth century[4] a page between two of Peter's treatises is devoted to a "Catalogue of writings which Peter of Abano partly composed himself, partly translated from the Greek." The list has not, I think, been noted by previous writers on Peter of Abano, but adds little to our knowledge of his compositions. What the sources for Peter's life are, however, appears in more detail in the appendices which follow and in the notes to the text.

Michael Savonarola.

What we have to consider further at present are the previous secondary accounts of Peter which may be reckoned as of some importance. The first occurs in the work on great citizens of Padua composed about the middle of the fifteenth century [1] by Michael Savonarola, the noted physician and medical writer and grandfather of the Florentine reformer, Girolamo Savonarola. Michael at least appreciated Peter's learning and shared in many respects his point of view, and, while he makes some assertions which we must regard as extremely exaggerated, if not entirely legendary, seems to have had access to documents which we no longer possess as well as to local tradition. He states that he treasures in his possession the original manuscript of the *Conciliator* in Peter's own hand-writing; and he mentions having read with great pleasure an abundance of letters by which the people of Padua had recalled Peter from Paris to their midst. Savonarola's account, however, is brief.[2]

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[1] An account of the editions and MSS of them will be found in Appendix II.

[2] G. B. Verci, *Storia della Marchia Trevigiana e Veronese*, Venice, 1786-1791, in Tome VII (not VIII, as it is usually incorrectly cited).

[3] Andrea Gloria, *Monumenti della Università di Padova* (1222-1318), *Presentata il 29 dicembre 1884*, *Memorie del Reale Istituto Veneto di Scienze, Lettere ed Arti*, vol. XXII, pp. 583-9. This publication, however, is rather an account from the monuments than the monuments themselves, of which Gloria printed only a limited number of copies and which I have not seen.

[4] Canon. Misc. 46, fol. 30v.

Secondary accounts since 1500.

Scardeone, who wrote in the sixteenth century *On the Antiquity of the City of Padua*,[3] can scarcely be regarded as so good an authority as Savonarola, but he makes new assertions concerning Peter's life and his account has been much followed by modern writers. In the early seventeenth century Naudé included Peter in his defense of great men who had been charged with magic,[4] but incorrectly gave the date of his death as 1305, while Tomasini gave 1316 as the date and included a portrait of Peter in his *Eulogies of Illustrious Men adorned with pictures*.[5] I have not seen the account of Peter in Duchastel's *Lives of Illustrious Physicians*,[6] published at Antwerp in 1618, nor Goulin's *A His-*

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[1] Muratori estimated that Savonarola completed the *Libellus de magnificis ornamentis regiae civitatis Paduae* soon after 1445.

[2] It is contained in Muratori, *Rerum Italicarum Scriptores*, XXIV, 1135-8.

[3] Bernardino Scardeone, *De antiquitate urbis Patavii et claris civibus Patavinis libri tres . . . eiusdem appendix de sepulchris insignibus exterorum Patavii iacentium*, Venice, Volgrisi, 1558. I have used the edition of Basel, 1560, where the account of Peter occurs at pp. 260-2. It is also printed in Graevius, *Thesaurus antiquitatum et historiarum Italiae*, 1725, Tom. VI, Pars. 3.

[4] Gabriel Naudé, *Apologie pour tous les grands personages qui ont esté faussement soupçonnez de Magie*, Paris, 1625, pp. 380-91.

[5] Jac. Phil. Tomasini, *Illustrium virorum elogia iconibus exornata*, Padua, 1630, p. 20.

[6] Duchastel, *Vitae illustrium medicorum qui toto orbe ad haec usque tempora floruerunt*, Anvers, 1618. I presume this is the "Castellan" whom Naudé cites.

torical and Critical Notice on the Life of Abano,[1] printed in 1715; but have used an article with a similar title which Count Gian-Maria Mazzuchelli[2] published in 1741 and which included a bibliography of Peter's works. Tiraboschi, in his *History of Italian Literature,*[3] corrected and supplemented Mazzuchelli on a number of points and in general displayed a sounder judgment than previous writers, although he still retained some of their errors. A further step in the study of Peter of Abano was taken by Colle who published a monograph concerning him in 1823,[4] which he reprinted in 1825 with some variations in his *Scientific and Literary History of the University of Padua.*[5] A monograph by Ronzoni in 1878[6] does not seem to have made any new contributions, but in 1884 Gloria adduced new source-material in his *Monuments of the University of Padua.*[7] and pointed out errors in Colle's account. Sante Ferrari discussed Peter's contributions to biology in a pamphlet published in 1900,[8] when it was stated that he would soon issue a volume upon Peter, but this expectation does not seem to have been realized. Meanwhile in 1912 B. Nardi discussed "The theory of the soul and the generation of forms according to Peter of Abano,"[9] and in 1916 Antonio Favaro wrote on "Pietro d'Abano ed suo 'Lucidator astrologiae'."[10]

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[1] Goulin, *Notice historique et critique sur la vie d'Abano,* in *Mémoires littéraires et critiques pour servir à l'histoire de la médecine,* Paris, 1715, p. 15.

[2] Mazzuchelli, *Notizie storiche e critiche intorno alla vita di Pietro d'Abano,* in *Raccolta d'opuscoli scientifici e fisiologici,* vol. XXIII, Venice, 1741.

[3] Tiraboschi, *Storia della Letteratura Italiana,* Modena, 1772-1795, vol. V (1775), pp. 152-9.

[4] Francesco Maria Colle, *Notizie sulla vita e sulle opere di Pietro d'Abano,* in *Opuscoli Filologici,* Padua, 1823, pp. 7-36.

[5] Colle, *Storia Scientifico-Letteraria dello Studio di Padova,* Padua, 1824, four vols., III (1825), 128-55.

[6] Ronzoni, *Della vita e delle opere di Pietro d'Abano,* Rome, 1878, in *Atti della R. Accademia dei Lincei, serie terza, Memorie della classe di scienze morali, storiche e filologiche,* II (1878), 526-50.

[7] See above, p. 914, note 3.

[8] Sante Ferrari, *Contribuzioni alla storia della biologia; Pietro d'Abano,* Genoa, Ciminago, 1900, 23 pp.

[9] B. Nardi, *La teoria dell' anima e la generazione delle forme secondo Pietro d'Abano,* in *Rivista di filosofia neo-scolastica,* IV (1912), 723-37.

[10] *Atti del R. Istituto Veneto,* LXXV, 515-27.

APPENDIX II

A BIBLIOGRAPHY OF PETER OF ABANO'S WRITINGS

Arrangement.

The following order will be observed in this list of Peter's works. First those to which an exact or probable date can be assigned will be taken up in chronological order. Next will be listed those which are undated but undoubtedly genuine. Last will be mentioned those of dubious or spurious authorship. As Peter's translations of the astrological treatises of Abraham Aben Ezra are closely connected with those of Henry Bate, and as Abraham and Bate are names of considerable importance in the history of astrological literature, a separate appendix following this one will be devoted to them and Peter's relations to their work. The following lists of MSS for Peter's various works can probably be greatly added to, but the present bibliography is fuller than any preceding one.

Translation of Abraham Aben Ezra, 1293.

Aside from Latin editions of single works (such as the *De nativitatibus,* Ratdolt, 1485, Cologne, 1537, which is not Peter's original Latin version anyway; and the *De luminaribus et criticis diebus,* 1508, 1544; *de criticis diebus,* 1496, 1550) the only inclusive edition seems to be:

Abrahe Avenaris Judei . . . in re judiciali opera, ab excellentissimo Philosopho Petro de Abano post accuratam castigationem in Latinum traducta, Ex officina Petri Liechtenstein, Venetiis, 1507. For further account of this edition and the MSS see Appendix III.

The *Physiognomy,* 1295.

Incipit liber compilationis phisonomie a Petro padubanensi in civitate Parisiensi. . . . Viro fulgenti domino Bardeloni de bocosis mantue honorandissimo capitaneo generali Petrus padubanensis parisius philosophie minimus alumnorum grata agere cum salute. Ed. Padua, 1474.

Decisiones Physionomiae . . . a Blondo medico . . . compertae inque lucem productae. Venice, 1548.

The earliest MS that I have seen is

BN 16089, 13-14th century, fols. 98r-113, "Incipit liber compilationis physonomie a magistro petro de padua in civitate parisiensi . . . Nobilitate generis urbanitatum titulis viro fulgenti domino bardelloni mantue honorabilissimo capitaneo generali de bona coxis petrus de padua parisius philosofie minimus alumpnorum grata agere cum. salute."

Practically the same is

BN 2598, fols. 87r-98r, "Explicit liber compilationis physonomie per petrum de padua anno domini millesimo ducentesimo nonagesimo quinto."

Other MSS, all of the 15th century, are:

BM Addit. 37079, fols. 3r-81v. Here the captain-general's name is spelled "Bardeloni . . . de Bonaconsis" and the Explicit gives the precise date, May 23, 1295.

BL Canon. Misc. 46, fols. 1-30, "Liber Physionomiae clarissimi viri Petri de Appono Patavini ab eo in civitate Parisiensi aeditus."

CLM 637, fols. 12-66.

Vienna 5307, fols. 23-32.

The work is listed in the catalogue of the MSS of Amplonius at Erfurt, written in 1412, "Math. 29, Egregius liber Petri Paduani de phisionomia," but seems to have disappeared from that collection since then.

Problems of Alexander of Aphrodisias.

Escorial f-I-11, 14th century (here we first have the Problems of Aristotle, or perhaps Peter's commentary on them "secundum speciem compilationis" and "secundum novam translationem," then), fols. 31-42, "Incipiunt problemata alexandri affrodiseos translata p. M. petrum Aponensem padue de greco in latinum. Archo. tr. unico . . . / . . . aut diversa inferiorum et superiorum molle figuratione. Explicit liber problematum alexandrii affrodiseos translatus per petrum padubanensem padue de greco in latinum MCCC secundo XV die decembris et sunt omnia problemata numero 197." On the other hand, the list of Peter's works contained in Canon. Misc. 46, speaks of these Problems as having "differentiae quinquaginta."

Translations of Galen.

CLM 5, written in 1304 A. D., fol. 181, Galeni de optima corporis nostri compositione et bona habitudine translatus per Petrum medicum Paduanum.

S. Marco XIV, 6, written at Bologna in 1305 A. D., fols. 68-106, contains Peter's completion of the translation of the Therapeutic Method, begun by Burgundio of Pisa.

Vienna 2294, 14th century, fols. 1-82v, De ingenio sanitatis quod deficiebat de translatione Burgundionis (usque ad libri xiv, c. 12) complete translatum per P. de Albano de Padua.

In the list of his works in Canon. Misc. 46 Peter is credited with the translation of six of Galen's treatises, namely: de cholera nigra, de utilitate particularium, de optima compositione, de tabe, liber creticorum, and a sixth title which I did not clearly make out, "Item transtulit librum eiusdem de re fa (or sa, perhaps sanitate) de verbo ad verbum non sicut ille abreviatur." This last translation was in 18 chapters.

The *Conciliator*, 1303.

Conciliator differentiarum philosophorum et precipue medicorum. Printed eight times before 1500 and several times thereafter. Most editions are to be found in the British Museum, but it does not have the first edition of 1471, Venetiis apud Octavianum Scotum, although it possesses the Venetian editions of 1521 and 1526, which are omitted from the bibliographies of Mazzuchelli and Colle. I have chiefly used, at the John Crerar Library, Chicago, the edition of 1526, and at the British Museum the very rare second edition, Mantua, 1472. The editions of 1476, 1483, 1490, and 1496 are also found in America (CFCB).

Quaestiones de febribus, pp. 217-40, in a collection of various authors on fevers printed in 1576, are simply nine Differentiae from the Conciliator.

Not many MSS appear to have survived; some are:

BN 6961, 1384 A. D., conciliator discordiarum medicinalium.

BN 6962, 15th century.

Library of the Dukes of Burgundy, 10871, early 16th century, Petri de Abano, Conciliator de medicinis, "Ad melius intelligendum."

Medic. 54, "Egregie questiones Petri Paduani consiliatoris," in the 1412 A. D. catalogue of Amplonius, seems no longer in that collection.

Harleian 3747, 15th century, fol. 233, Petri de Ebano de balneis, is probably an extract from the Conciliator.

Vienna 5289, 15th century, fol. 15r, Cura epidimiae, "Recipe radices pedis corvini . . . / . . . adiustionem prohibitum," ascribed to

Peter and immediately followed by his De venenis, is perhaps also an extract from the Conciliator.

On the astrolabe.

It appears to have been printed twice but I have not seen either edition:

Astrolabium planum in tabulis ascendens continens qualibet hora atque minuto aequationes domorum coeli significationes imaginum moram nati in utero matris cum quodam tractatus nativitatum necnon horas inaequales pro quolibet climate mundi, Venice, 1488; and 1502 (Luc' Antonio de Giunta).

Perhaps it is the same as the following work ascribed to Peter in a MS at Munich which I have been unable to inspect:

CLM 22048, 15th century, 176 fols., De signis celestibus eorumque significatione et potestate, cum multis tabulis astronomicis.

Kroll and Skutsch, in their edition of Julius Firmicus Maternus, II (1913), xxviii, list what appears to be another edition of the same year, 1488, at Augsburg, and which they say was reprinted in 1494 and often thereafter.

Opus Astrolabii plani in tabulis: a Iohanne Angeli artium liberalium magistro a nouo elaboratum; explicit feliciter. Erhardi ratdolt Augustensis viri solertis: eximia industria: et mira imprimendi arte: qua nuper veneciis: nunc Auguste vindelicorum excellet nominatissimus. Vigesimoseptimo kalendas Novembris. M. CCC. LXXXVIII. Laus deo.

This edition, Kroll and Skutsch state, contained portions of the Mathesis of Firmicus, and some notes which Peter of Abano had added to the astrological images (Kroll et Skutsch, II, xxxii). Whether these brief notes are Peter's sole connection with the Astrolabium planum, they do not make clear.

On the motion of the eighth sphere, 1310.

I have seen it stated somewhere that it forms a part of the preceding work. I have read the treatise in the first of the following MSS:

Canon. Misc. 190, 1445 A. D., fols. 78r-83v, Tractatus motus octave spere.

Cod. Vatic. Palat. Lat. 1377, 14-15th century, fols. 1r-5r, "Incipit tractatus quem composuit magister Petrus Paduanus in motu octave spere et sequitur capitulum primum prohemiale in operis causa et ipsius intentione. Quoniam iuxta Ptholomeum rerum quippe causas . . . / . . . inde causa existit prefati. Explicit tractatus motus octave spere ordinatus a magistro Petro Paduanensi anno gratiae 1310."

Vienna 5498, 15th century, fols. 60r-70v, "Libellus in motu octave sphere."

The *Lucidator*, 1310.

The fuller title, "Lucidator dubitabilium astronomie," is used by Peter himself in citing the work in the Prohemium to his treatise on the motion of the eighth sphere.

BN 2598, following the Physonomia, fols. 99r-125v, "Quoniam astrologyce considerationis ambiguitates. . . ." At fol. 125v the copyist, Petrus Collensis, whom Duhem characterizes as "scribe aussi maladroit qu'ignorant latiniste," adds his name and a table of contents comprising ten questions. But the last four of these do not seem to be discussed in the text, of which the last three pages contain rather the beginning of the treatise on the motion of the eighth sphere. Therefore we have only the preface and first six Differentiae of the Lucidator. No copy of the Lucidator was known before Duhem, Études sur Léonard de Vinci, 1906-1909, I, 50-51, called attention to this MS.

Commentary on the *Problems* of Aristotle, 1310.

Expositio in librum problematum Aristotelis, Mantua 1475; Padua, 1482, 1501, 1520. The editio princeps of 1475 is not in the British Museum, although it has the other three editions, but copies of it exist in America (CFCB). The 1482 edition is said to have really been printed at Venice by Herbort. I have consulted the edition of 1482 in this country at the Columbia University Library. The Incipit in the 1482 edition reads, 'Expositio praeclarissimi atque eximii artium ac medicinae doctoris Petri de Ebano Patavini in librum Problematum Aristotelis feliciter incipit."

But the Explicit is given imperfectly in this 1482 edition and may better be repeated after a Venetian MS, S. Marco XII, 84, 14th century, fols. 1-139, "Explicit expositio succincta compilationis problematum Aristotelis quam Petrus edidit Padubanensis et a nullo prius interpretante; incepta quidem Parisius et laudabiliter Paduae terminata anno legis Christianorum millesimo trecentesimo decimo cum laude Dei altissimi cuius nomen sit benedictum per saecula, amen." The Explicit as given in the first edition similarly stated that Peter composed the work partly in Paris and finished it in Padua in 1310. The Venetian MS just mentioned omits the text of Aristotle and gives only Peter's commentary.

BN 6540. An illuminated MS with a picture at the beginning of a smooth-shaven man in gown and hood which is possibly meant for Peter. This MS would presumably be the autograph, were the MSS Catalogue right in dating it in 1310 A. D.; but I think that the date when the Explicit states that the work was completed has been incorrectly assumed to be the time when the MS was written. There seems to be nothing about the MS to indicate that it was written as early as 1310.

BN 6541, 14th century.

BN 6541A, 15th century.

BN 6542, 1385 A. D., per m. de Jenduno (i.e. Jean de Jandun) elucidata et declarata.

BN 6543, 14th century.

Arsenal 723, 15th century, 286 fols. This also begins with the prologue of Jean de Jandun who lectured on the work at Paris from a copy of Peter's Commentary given him by the famous Marsiglio of Padua.

Mazarine 3520, 14th century. According to the MSS Catalogue, the prologue differs from that in the 1519 (1520?) edition, but the text is the same except that it stops in the midst of the 28th problem under Particula X.

Digby 77, 14th century, fols. 57-82, Summa Problematum Aristotelis "secundum Petrum Paduanensem."

BM Addit. 21978, 1477 A. D. Two other translations of Aristotle's Problems accompany Peter's work in this MS.

Peterhouse 79, 14th century, "Expl. prior exposicio huius libri per petrum padubanensem incepta parisius et finita padue cum gaudio magno. deo sit honor."

On poisons, 1316 (?).

Tractatus de venenis (also in the MSS, "Pollex de venenis" or "Pollex venenorum"), Mantua 1472 (or 1473?); Padua, 1473; also in 1484, 1490, 1495, 1515, 1555, and, with the Conciliator, in 1476, 1496, 1499, and 1521. CFCB also lists separate editions of 1475, 1487, 1498, and 1500.

Amplon. Q. 222, mid. 14th century, fols. 227-37.

CLM 77, 1386 A. D., fols. 142-5.

CLM 184, 1439-1444 A. D., fol. 272-.

CLM 257, 15th century, fol. 111-.

Berlin 909, 15th century, fol. 107-.

Vienna 2358, fols. 150-7; 4751, fols. 218-37; 5289, fols. 16r-19v; 5398, fols. 197-204; all of 15th century.
BM Addit. 37079, 15th century, fols. 83r-131v.
Canon. Misc. 46, fol. 31-; 455, fols. 176-83; both 15th century.
Bodleian 484 (Bernard 2063, #26), fols. 206-26.
Vendôme 243, 18 Jan. 1441, fols. 176-83.
Arsenal 873, 15th century, fol. 97-.
BN nouv. acq. 1789, moyen format, fols. 99-110.
Library of Dukes of Burgundy, 8554, 15th century.
Bibl. Naz. Turin H-II-16, 15th century, fol. 115v.
Naples XII-G-78, 15th century, in Italian.
Vicenza 328, in Italian.
Volterra 1, 16th century.
Florence, Nelli 243, 16th century; 374, 18th century.
Riccard. 1177, 15th century, fols. 7-13.

Addition to Mesue.

Petri Apponi in librum J. Mesue (Yuhanna ibn Masawaih) additio, fols. 100r-129 in the 1471 edition of Yuhanna ibn Masawaih, fols. 111-21 in the 1495 edition. Also printed in 1485, 1491, 1497, 1513, 1523, 1531, 1541, 1551, 1602, 1623.
S. Marco XIV, 42, 14th century, fols. 194-222.
CLM 8, completus Paduae ann. 1464, fols. 120-38, Additiones libri Mesuae ut communiter traditur Francisci pede montium, immo Conciliatoris. In the 1495 edition additions by Francis of Piedmont follow those of Peter of Abano.
CLM 13, fol. 223-; 81, 14-15th century; 25061, 15th century, fols. 337-8.
Sloane 3124, 15th century, fols. 276-323.

Dioscorides.

Dioscorides, De materia medica, Colle, 1478. "Explicit dyascorides quem petrus paduanensis legendo corexit et exponendo que utiliora sunt in lucem deduxit."
Dioscorides digestus alphabetico ordine additis annotatiunculis brevibus et tractatu de aquarum natura, Lugduni, 1512. This is said to be a reproduction of the 1478 edition.
BN 6820, 14th century, fols. 1-72r, words the Explicit a little differently from the edition of 1478: "Explicit dyascorides quem petrus paduanensis legendo correxit et exponendo que occultiora in lucem deduxit.

There are said to be a number of MSS of this medieval enlarged Latin Dioscorides, which indeed Wellman ("Dioskurides" in PW) calls "the most widely-disseminated handbook of pharmacy, which dominated the whole later middle ages," but Peter's edition of it is not well distinguished from preceding ones. Wellmann, for example, says nothing of Peter's commentary and corrections.

Pseudo-Hippocrates.

Libellus de medicorum astrologia a Petro de Abbano in latinum traductus, Venice, Ratdolt, 1485 (in "Opusculum repertorii pronosticon in mutationes aeris"). Many copies in America (CFCB).

Tractatulus Hypocratis medicorum optimi De aspectibus planetarum versus Lunam (a Petro de abbano in latinum traductus), Leipzig, 1505.

Printed with Magninus, Regimen Sanitatis, 1500, 1517, 1524.

Printed in 1585 and 1626 by Z. T. Bovio.

Also found with the works of Hippocrates and Galen in various editions and in the 1497 edition of Rasis.

MSS are also numerous, but catalogues usually do not state whether William of Moerbeke or Peter of Abano is the translator. It is ascribed to the former, however, in

BN 7337, pp. 78-84, Liber hyppocratis de prognosticationibus egritudinum secundum motum lune traductus a domino fratre Guglielmo de Morbercha archiepiscopo Corintino ordinis predicatorum.

Vienna 5498, 15th century, fols. 53-59, our treatise precedes that of Peter on the motion of the eighth sphere.

Vienna 5275, 16th century, fol. 195, Pseudo-Hippocrates, Fragmentum libri de medicorum astrologia a Petro de Abano in latinum sermonem traducti.

Sloane 780, 15th century, fols. 55v-58v, "De iudiciis a lune observatione formandis de sanitate vita et morte infirmiorum," is the Peter of Abano version, opening, "Cum legerem libros hypocratis medicorum optimi inveni hunc parvum sed magne utilitatis librum. . . ."

Sloane 636, 15th century, fols. 98v-102v, has the Incipit of William of Moerbeke's translation (Quetif and Echard, 1719, I, 390), "Sapientissimus ypocras omnium medicorum peritissimus ait, Inscius medicus est qui astronomiam ignorat. . . ." This is also the Incipit of Digby 29, 15th century, fols. 167-72.

The recently revised catalogue of the Royal MSS notes that a third version, which apparently is neither by William of Moerbeke nor Peter, is found in

Royal 12-C-XVIII, 14th century, fols. 33v-36r, which opens, "Dixit ypocras qui fuit medicus et magister optimus et medicus non est qui astronomiam ignorat";

Sloane 3171, fols. 104v-116, which opens, "Dixit ypocras medicorum optimus cuiusmodi medicus est qui astrononiam ignorat";

Sloane 3282, fols. 89v-90, which opens, "Dixit ypocras qui fuit medicus et magister optimus cuiusmodi medicus est qui non astronomiam nossit";

Cotton Appendix VI, fols. 5r-8r, which opens, "Dixit ypocras qui fuit medicus et magister optimus cuiusmodi medicus est qui astronomiam ignorat."

Digby 28, early 14th century, fols. 81v-85, which opens, "Dixit Ypo. non est medicus qui astronomiam non novit," is perhaps the same version; at any rate Coxe says that it differs from Digby 29, William of Moerbeke's translation.

Geo-mancy.

Geomantia, in Latin according to Mazzuchelli, Venice, 1549 and 1586. I have not seen either.

Geomantia di Pietro d'Abano nuovamente tradotta di Latino in volgare per il Tricasso Mantuano, Venice, 1542.

Novamente dall' eccell. M. S. Musio da Capoa ricorsa, 2 pts., Vinegia, 1546-1550. Another edition, Venice, 1550.

Comincia la Geomantia di P. d'Abano tradotta di Lattina lingua, Venice, 1556.

CLM 392, 15th century, fol. 69-.

CLM 489, 16th century, fols. 222-33, "Desideravi verum et certum Iudicium dare secundum gloriosam et venerabilem scientiam Geomantiae . . . / . . . Explicit liber Petri de Abano. P."

Sandaniele del Friuli 240, 15th century, "Incipit modum iudicandi questiones geomantie sive modum magistri Petri. Considerantibus (?) verum et certum . . . / . . . veluti nocturna. Explicit liber Geomantiae. Deo gratias Amen."

Prophecies.

Questa sie la profetia composta per el reverendissimo negromante piero dabano . . . Bologna, 1495.

Vatican 5356, fol. 28, Variae prophetiae Magistri Petri Patavini de Abano.

Heptameron, or *Elements of magic.*

Kiesewetter, Der Occultismus des Alterthums, mentions a Latin edition, Venice, 1496, which I have neither seen nor found mentioned elsewhere.

It was printed together with the Occult Philosophy of Henry Cornelius Agrippa in Latin at Paris, 1565, and in 1600 and 1655 in English translation.

Also in J. Scheible, Kleiner Wunder-Schauplatz, Theil 10, 1855.

In French as Les Oeuvres Magiques de Henri-Corneille Agrippa, par Pierre d'Aban (Heptameron ou les élémens magiques de Pierre Aban, Philosophe, Disciple de Henri-Corneille Agrippa), Liège, 1788.

Sloane 3850, 17th century, fols. 13v-23.

CLM 24936, 17th century, pp. 94-131, Petri de Abano doctoris urbis Pataviae Magia.

Vienna 11294, 17th century, fols. 41r-74v.

BN 17870, 18th century.

Elucidarium necromanticum.

Vatican, Regina Sueviae 2014, according to Mazzuchelli (1741) p. liii, who, like Naudé, lists this as a separate treatise different from the Heptameron.

Annulorum experimenta.

BN 7337, 15th century, pp. 131-8, "Peritissimi artium ac medicine doctoris in omnibusque scientiis excellentissimi magistri Petri de abbano annulorum experimenta feliciter incipiunt. Primo et principaliter in hac arte considerandum est quod 28 sunt mansiones lune." This seems to be the work described by Naudé as "Liber experimentorum mirabilium de annulis secundum 28 mansiones Lunae."

Circulus philosophicus.

CLM 17711, 17th century, fols. 284-307, is perhaps identical with one of the three preceding works.

APPENDIX III

PETER OF ABANO, ABRAHAM ABEN EZRA, AND HENRY BATE

French translation from the Hebrew.

The French translation from the Hebrew of astrological treatises by Abraham Aben Ezra is preserved in BN, fonds de Sorbonne, 1825. I have not seen the MS but infer from the description in HL XXI, 500-3 that it includes only five of Abraham's treatises, The Beginning of Wisdom, Nativities, Revolutions, Elections, and Interrogations. At the close of The Beginning of Wisdom we are told that it was written down by Obers de Montdidier from the dictation of Hagins the Jew in the house of Sire Henri Bate at Malines and finished December 22, 1273.

One MS of Peter of Abano's version, BN supplem. lat. 151, is partially described in HL 21, 501. Others which I

Peter of Abano's Latin version.

have examined are BN 7336, BN 7438, Canon. Misc. 190. I have seen various other MSS noted in catalogues and elsewhere, but such notices seldom seem to give a full and accurate list of the treatises. They were printed in 1507 by Peter Liechtenstein as noted in Appendix II. All copies which I have seen contain at the close of the first treatise, the *Liber Introductorius* or Beginning of Wisdom, the passage, of which HL 21, 501 has already quoted the Latin, stating that when Peter of Abano the Paduan found this work "in Gallic idiom, through the unskilfulness of the translator from the Hebrew defective in many ways, corrupt, and sometimes poorly arranged and failing to make sense, as far as he could he brought it back in the Latin tongue to Abraham's original meaning." The date is then given as 1293. Peter is also usually named as the translator at the beginning or end of the other treatises.

Additional treatises in Peter's version.

In the Latin versions of Abraham's astrological treatises besides the five named by the Histoire Littéraire are found the *Liber rationum,*[1] the *Liber luminarium et de cognitione diei cretici,*[2] and *Tractatus particulares,* which are really three treatises, namely: (1) "Incipit alius tractatus particulare. Incipit tractatus de partibus horarum in interrogationibus";[3] (2) "Tractatus in tredecim manieribus planetarum";[4] and (3) "Tractatus de significationibus planetarum in duodecim domibus Abrahe."[5] The *De consuetudinibus in judiciis astrorum et est centiloquium Bethen,* which occurs in the midst of Abraham's treatises in the MSS, is probably not by him and is placed last in the 1507 edition. The *Tractatus particulares* are not included by

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[1] Incipit liber de rationibus habrabe avenerze quem transtulit petrus paduanus . . . Explicit translatio libri de rationibus per petrum paduanum.

[2] Explicit liber luminarium Abrabe Avenare quem Petrus de Padua Lombardus ordinavit quam melius potuit in planum ydioma latinum, qui liber potest de cognitione cause crisis intitulari. It was printed separately by Ratdolt, Venice, 1482.

[3] This Titulus is wanting in the printed edition (1507), fol. lxxxv recto, but is found in BN 7336, fol. 109r and 7438, fol. 168v.

[4] Or "Incipit liber significationum septem planetarum et earum generibus vel maneriebus."

[5] At its close "Finis quorundam tractatuum particularium Abrahe Avenare quos Petrus Paduanus ordinavit in latinum."

Steinschneider in his list of Abraham's astrological writings.[1]

A Latin translation by Henry Bate.

While in general the Latin translation of Abraham's astrological treatises is ascribed to Peter, in all the editions and manuscripts that I have seen,[2] one of them, entitled *De mundo vel seculo* and dealing with conjunctions and revolutions, is ascribed to Henry Bate, the same under whose patronage the French translations were made.[3] It would therefore seem that Peter found Henry Bate's own Latin translation of 1281 more satisfactory than the French translation made at Bate's house in 1273,[4] and did not attempt to revise it. In some manuscripts Bate is also credited with a Latin translation of The Beginning of Wisdom or *Liber introductorius,* made in 1292.[5]

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[1] In his article "Abraham Ibn Ezra" in *Abhandl. z. Gesch. d. Math. Wiss.* III, 2 (1880), p. 127, Steinschneider devoted only the four closing pages of this long article to Abraham's astronomy and astrology, promising a future article on that subject, but I do not know if it ever appeared.

[2] According to the recent catalogue of the Royal MSS, *"Elecciones Abraham"* in Royal 12-C-XVIII, 14th century, fols. 26-30, is "not the same translation as that (by Pietro of Abano) printed, Venice, 1507," and this seems to be the case, although by a coincidence the opening and closing words are the same, *"Sapientes legis"* and *"dixerunt antiqui."*

[3] "Explicit liber de mundo vel seculo completus die lune hore post festum beati luce hora diei quasi 10, anno domini 1281, inceptus in leodio, perfectus in machilinia, translatus a magistro Henrico bate de hebreo in latinum":—ed. of 1507, fol. lxxxv recto; BN 7336, fol. 109r; Canon. Misc. 190, fol. 69; Digby 114, fol. 175; Vienna 4146, fol. 264. CU Emmanuel 70, 15th century, fols. 137v-44, however, gives the date as 1292, "Expl. lib. de mundo et seculo completus die Jovis post fest. S. barnabe Ap. sub ascendente scorpionis a. d. 1292 in perside (?) translatus autem a mag. Henr. dicto bate de machelia de hebreo in latinum." Sloane 312, 15th century, fols. 70v-97.

[4] Apparently in the eight intervening years Bate had learned enough Hebrew to translate Abraham himself.

[5] Cod. Lips. un. 1466, fols. 1-24; Berlin 963, 15th century, fols. 152-63; Vatic. Palat. Lat. 1377, 14th century, fols. 21r-37v, "Translatus est hic liber a magistro Henrico de Malinis dicto Bate cantore Leodiensis, et est hec translatio perfecta in urbe veteri a. d. 1292"; Wolfenbüttel 2816, anno 1461, fols. 84-111, "Abraham avenezre initium sapientiae. . . . Translatus est a magistro Henrico de Malynis dicto Bate, cantore Leodiensi. Perfecta est hec translatio in Urbe Veteri anno Domini 1292." In this last MS follows a *De fortitudine planetarum,* said to have been translated "in the old city by master Henry of Malines, called Bate," but the date is given as 1272. I have been unable to examine any of these MSS to see if the translation is really the same as that usually ascribed to Peter of Abano, but Björnbo

Other writings of Henry Bate.

This Henry Bate was called by Pico della Mirandola "a disciple of Albertus Magnus." [1] In 1274 at Malines and in fulfilment of a promise made to William of Moerbeke, the noted translator of the Dominican Order and at that time papal chaplain and penitentiary, when they were together in Lyons, Bate composed a treatise on the astrolabe.[2] Later Bate also wrote an account of his own horoscope and destiny.[3] It gives the year of his birth as 1244. He was a canon, doctor of theology, and university professor; and seems to have spent his life mainly at Malines, Liège, and Paris. He also wrote on errors in the Alfonsine astronomical tables.[4] Another unpublished work of his is entitled *Speculum divinorum et quorundam naturalium.*[5]

Other works by Abraham.

There were also Latin versions of other astronomical and astrological works by Abraham than those translated by Bate or Peter.[6] One cannot, however, be sure that "Abraham Judaeus" always refers to Abraham Avenezra, as there was a translator or translators of the thirteenth century by that name. Simon Cordo of Genoa was assisted in his Latin translation of the medical works of Serapion by

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(*Abhandl. z. Gesch. d. Math. Wiss.*, XXVI, 1911, p. 135) gives that impression.

[1] *Adversus astrologos*, IX, 3.

[2] Digby, 48, 15th century, fols. 143v-152r. "Magistratus composicio astrolabi hanrici bate . . . quod vobis promissum est cum apud vos essem Lugduniensis. . . . Expletum est hoc opusculum ab Hanrico Bate in villa Machliniensi Luna coniuncta Jovi in domo septima ascendente luna a. d. MCCLXXIIII quinto idus Octobris ad peticionem fratris Vuilhelmi de Morbeca, ordinis Predicatorum, domini pape penitenciarii et capellani"; also printed by Erhard Ratdolt, Venice, 1485, with a *De natiuitatibus* ascribed to Abraham Judaeus (printed again, Cologne, 1537) which is quite different from the treatise on Revolutions and Nativities translated by Abano.

[3] Contained in BN 7324, *Nativitas magistri Henrici Mechlinensis cum quibusdam revolutionibus*, and described in HL 26, 561-2.

[4] HL 26, 558-61 and Wolfenbüttel 2816, anno 1461, fols. 9-12, Tractatus in quo ostenditur defectus tabularum Alfonsi, compositus a magistro Henrico Bate de Machlinia A. D. 1347" (*sic*).

[5] Library of Dukes of Burgundy 7500, 15th century, or, as it is entitled in two St. Omer MSS (Maurice de Wolf, "Henri de Bate de Malines" in *Bulletins de l'Académie Royale Belgique, Classe des lettres*, 1909), "Speculum divinarum humanarumque rerum."

[6] BN 7377A, No. 4 and BN 9335, 14th century, fols. 126v-135, liber augmenti et diminutionis qui vocatur numeratio divinationis secundum Indos. BN 16648, 13th century, fols. 106-46, liber qui dicitur abrahismus. . . . "Dixit habraham iudeus, cognitum est corpus solare. . . ."

an Abraham Judaeus of Tortosa;[1] and Alfonso X of Castile employed a Jew named Abraham in astronomical translation from Arabic into Spanish.[2] An Abraham Iudeus of Barcelona translated Haly on Elections from Arabic into Latin,[3] and was perhaps the same as Abraham Bar Chasdai, a rabbi of Barcelona who translated the supposititious Aristotelian work *De pomo* from Arabic into Hebrew, after which Manfred, the illegitimate son of Emperor Frederick II, translated it or had it translated from Hebrew into Latin.

APPENDIX IV

WAS PETER CALLED TO TREVISO IN 1314?

It was stated by Bonifazio in his *History of Treviso,*[4] and repeated by Mazzuchelli[5] and Tiraboschi,[6] that on August 7, 1314, the Trevisans, wishing to establish a university, brought Peter to their city, where he taught and practiced medicine for a year. Colle[7] agreed that he received a call but doubted if he accepted it because his will, drawn up in 1315, makes it appear that he is still in the employ of Padua. But it is not quite certain that he even received a call, if we judge from the extant original documents,[8] a decree issued by the government of Treviso on August 9, 1314, and letters of the 15th and 16th of that month. The decree indeed aims at the institution of professorial chairs in the two laws and medicine (*phisica*) at Treviso, namely, Ordinary Lecturers in Civil and Canon Law, and Extraordinary Lecturers in Civil Law and Medicine. Under each of these four heads it lists three names, and that of "Master Peter of Abano" heads those in medicine. But the decree further states that "the doctors named below" are to be balloted upon, and apparently by lot,[1] and thus arranged in order of first, second, and third choice. The position is then to be offered to the first one chosen; if he refuses, to the second; and so on. It is also stated that the incumbents "are to lecture and teach through three years continuously after their arrival," not for one year. The normal salary is set at four hundred petty pounds annually, although the Council of Three Hundred are left some liberty in increasing or diminishing this amount. Moreover, we have a letter of August sixteenth notifying Peter of Suzara of his final appointment after he had indicated that he would accept the election. Similar letters were sent to five others of the twelve men named in the decree, and the name of Peter of Abano is not found among the five, the professor named in medicine being Henzelerius or Hengelerius. Either therefore Peter of Abano had not been elected or had refused to accept the appointment.

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[1] See the printed editions, *Liber Serapionis aggregatus in medicinis simplicibus,* 1479; *liber Servitoris liber xxviii,* 1471; etc.

[2] Canon. Misc. 45, 15th century, 56 fols. "Abulhaze Abnelaiitan liber de mundo et coelo, de notibus planetarum, etc., in partes duas distinctus per Abraham Hebraeum jubente Alphonso Hispaniae rege de Arabico in Hispanum, postea ab anonymo quodam in Latinum versus cum figuris praeviis capitulorum elencho et Alphonso epistola." Arundel 377, 13th century, fols. 56v-68, Magistri Habrahe de tabulis planetarum.

[3] Sloane 312, 15th century, fols. 252-5, 215-51. The same MS contains two works by Abraham Avenezra with whom Scott, in his Index of the Sloane MSS has identified—probably incorrectly—this Abraham the translator.

[4] Bonifazio, *Storia di Trevigi,* 1591, p. 354.

[5] Mazzuchelli (1741), p. xxii.

[6] Tiraboschi (1775) V, 51 and 156.

[7] Colle (1825) III, 133.

[8] Verci (1787) VII, *Documenti,* pp. 39-40, 43-4, 46-7 (from Raccolta Scotti, IV, 376, 342, 388).

APPENDIX V

PETER'S SALARY AT PADUA

Amount exaggerated.

The amount of salary offered at Treviso was worth mentioning because the statement has been made over and over again that Peter in his will of 1315 bequeathed to the town government of Padua fifteen hundred lire or pounds that were due him for his past three months' salary. From this it was inferred that his annual stipend was either six thousand pounds, or four thousand if reckoned on the basis of an academic year of eight months. This seemed to show that he was the highest paid professor of his own, not to mention our, age. On turning, however, to the will as printed by Verci[1] we discover that the fifteen hundred pounds represent three years of back pay, and that Peter further bequeaths to the commune of Padua five hundred pounds of small *denarii* due on his salary, presumably for the current year.[2]

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[1] ". . . quod infrascripti Doctores per sortem eligantur . . . quod illi qui scripti sunt inferius ad lecturam ordinariam per se sortiri debeant unus contra alium ad buffolos et ballotas. . . . Et simili forma observetur et debeat observari in scriptis ad extraordinariam lecturam . . ."

Why was it so far in arrears?

This puts an entirely different aspect upon the matter. It not only shows that Peter's stipend was scarcely a tithe of what had been supposed, although a good salary for the times, as a comparison with that offered at Treviso and with the amounts of the other legacies made by Peter in his will indicates. It also raises the question, why was the payment of Peter's salary some four years in arrears? And why does Peter make a distinction between five hundred pounds for which he holds papers (*Bulletas*) from the town officials and the fifteen hundred pounds due him for the previous three years and for which he apparently has nothing to show. Is there some question as to his claim for salary for those three years or even as to his having been in the Commune's employ? Probably the simplest explanation is that after failing to receive his salary for these years Peter took the precaution to get a definite statement concerning it for the fourth. This might also serve to explain why Treviso had hopes of getting him away from Padua in 1314, and why he stayed on in 1315. The years just preceding 1315 seem to have been a troublous time for the city of Padua, which incurred a heavy sentence from the emperor Henry VII, and had wars with Vicenza and Can Grande, not to mention civil strife such as that of April, 1314, when another Peter —*Judex de Altichino*—was slain with his sons in the public square by the people, their goods confiscated, and the family banished to the fourth generation.[1]

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[1] Which Colle, although he wrote after the publication of Verci's work, did not take the trouble to do. Gloria was apparently the first to note that the time was three years and not three months.

[2] Verci (1787) VII, *Documenti*, 117-8. "Item reliquit Communi Padue libras quingentas denariorum parvorum quas habere debebat a dicto Communi Padue pro suo debito salario de quo habebat Bulletas dominorum Potestatis Ancianorum et Gastaldionum Communis Padue supradicti. Item reliquit eidem Communi Padue libras mille et quingentas quas habere debebat a dicto Communi Padue pro suo salario de tribus annis retroactis."

There seems to be no quarrel between Peter and the Commune of Padua, for he goes on in his will to entrust himself, his children, and his property to its tutelage and defense, besides leaving the Commune the two thousand pounds in question. Also as Peter makes his will in Padua, where most of his legatees live, where he still has his residence, and where he intends to be buried, it appears that in May, 1315, he still is in the employ of that city and has been for years past. So he has not yet gone to Treviso or elsewhere. Nor is his bequeathing the two thousand pounds arrears to the city a sure indication that he does not intend to teach there any more, either because he expects to die soon, or to accept a position in another university, or to cease teaching entirely because of old age. These arrears are an asset and he has to dispose of them somehow in making his will; he evidently has continued to teach when one and two years' pay was owing him, and he may continue to do so now when three or four years' salary is in arrears. However, it must be said that he shows no hope of ever recovering these arrears, nor is there any evidence that he ever did.

APPENDIX VI

WHEN DID PETER DIE?

The date of Peter's death may be placed between May 25, 1315, when he made his will, and November 19, 1318, when the record of a legal transaction in which his sons were concerned appears to speak of him as dead.[1] It has usually been assumed that he died in 1315 or 1316 and these dates are given in epitaphs,[2] which, however, were composed long afterwards and cannot be accepted as sure proof. Peter's making his will has been taken as a sign that he was at death's door and died almost immediately afterward, but this inference does not seem necessarily to follow either from the will proper or from the accompanying confession of faith which he made on the day preceding. Arnald of Villanova, it will be recalled, made his will in 1305 but lived on until 1311. Peter concludes his confession of faith by affirming that such has been his belief in the past, is now, "and will be to the very end of his life." [3] Unless we assume that this last clause is added simply as a matter of form or as a safeguard against the possibility of the Inquisition's making the charge that immediately after his confession Peter became a heretic or relapsed into his previous heresy—unless we make such an assumption, which may be entirely unwarranted—the natural conclusion is that Peter did not expect to die immediately.

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[1] *Chronicon Patavinum ab 1174-1390* in Muratori, *Antiquitates* (1741) IV, 1156-7 (covering the years 1311-1315).

The language of the will itself points in the same direction. Peter, "a provident and discreet man," contemplating the unstable condition of human nature and noting that "those things which have the appearance of lasting for a long time" nevertheless "tend visibly toward their end," has decided to meet such perils half-way and happily anticipate the last day of life by a will made when in full possession of his senses and intellectual faculties.[4] No mention is made of his being in ill health, unlike another will of the same period quoted in the same volume of Verci, in which the testator speaks of himself as "of sound mind, although afflicted body, not wishing to depart this world intestate." [1]

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[1] Gloria (1884), p. 587, note 6, "Mill. trec. decimo octavo ind. prima die decimo nono mens. Nov. cora, d. B. (Bernardo) Dei gratia venerab. abbate monast. S. Marie de Pratalea—Benvenutus q. fil. mag. Petri fisici olim ser Constancii de Abano pro se—et vice Petri et Zifredi suorum fratrum q. eiusd. d. Petri et suorum heredum—vendidit."

[2] Mazzuchelli (1741), pp. xxxv-xxxvi; Gloria (1884), p. 586; Tomasini (1630), p. 22.

[3] Verci (1787) VII, *Documenti*, 119, "et in hac credulitate fuit, est, et erit usque ad extremum vite exitum."

[4] Verci (1787) VII, *Documenti*, 116. "Providus et discretus vir Magister Petrus filius qu. domini Constancii de Abano de contrata Sancte Lucie de Padua, Artis Medicine Philosophie et Astrologie professor, attendens et considerans quod instabilis sit humane nature status et condicio et quod ea que verisimiliter diu dura-

Other indications that Peter not only did not die immediately after making his will, but continued to teach and write, are the fairly strong evidence and probability that the pope to whom his treatise on poisons is addressed is John XXII, who was not elected until August 7, 1316; and the dubious assertion in a fifteenth century manuscript that Peter was acting dean of Montpellier at that time. We might also add that a prefatory note in the 1555 edition of the *De venenis* states that he lived to be almost an octogenarian.

APPENDIX VII

WAS THE DE VENENIS ADDRESSED TO POPE JOHN XXII (1316-1334)?

Survey of the editions and MSS.

In some nine printed editions which I have examined the pope addressed is denoted simply by the letter "N"; and most of the MSS do not specify the pope by name, or if they do, it is not so stated in the catalogues. Giacosa [2] says that the treatise is dedicated in some MSS to Pope Honorius IV, but he does not specify them, and I do not know of any such. Where the pope is named, he is either John without enumeration,[3] or John XXII.[4] It is perhaps worth

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tura habere videntur essentiam tendunt visibiliter ad non esse. Ideoque tantis periculis occurrere cupiens et dispositione Testamentaria vite diem extremum feliciter et salubriter prevenire sana integra et plena mentis sensus et intellectus cognitione ut quieti corporis et anime sue provideat et saluti tale de suis bonis per nuncupationem suam condidit Testamentum sic dicens. . . ."

[1] Verci (1787) VII, 77, ". . . sane mentis, tamen de corpore gravatus, nolens de hoc mundo decedere intestatus."

[2] P. Giacosa, *Magistri Salernitani nondum editi*, 1901, p. 495.

[3] Addit. 37079, 15th century, fols. 83r-131v, "Pollex incipit de venenis editus a petro de abano peritissimo pad. Sanctissimo ac Reverendissimo in Christo domino Domino Johanni divi providentia pape et summo pontifici." Some later hand, presumably Protestant, has drawn a line through the words *pape* and *summo*.

noting that there never was any John XX, and that John XXI is sometimes called John XX, and John XXII is called John XXI, but that the converse is impossible. In view of this uncertainty in the enumeration, it would also not be surprising to find either John XXI or XXII named without enumeration. Scardeone [1] in the sixteenth century asserted that the *De venenis* was dedicated to John XXII, although this conflicts with his statement that Peter died in 1315. Mazzuchelli [2] spoke of an Italian translation in which the pope is called Giacomo. There never was a pope so styled, but both Honorius IV and John XXII (called John XXI by Mazzuchelli owing to the error above noted) bore the name Giacomo before they assumed their pontifical designations. Another cogent reason for dismissing John XXI (1276-1277) from consideration is that Peter at the age of twenty-six or twenty-seven would neither have adopted the authoritative tone that he employs in the *De venenis* in addressing a pope who had himself, as Petrus Hispanus, been a medical writer of note, nor have failed to advert to that pope's own medical works.

In the *De venenis* [3] Peter cites the Latin translation of a treatise by Avenzoar ('Abd al Malik ibn Zuhr ibn 'Abd al

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Amplon. Q. 222, mid 14th century, fols. 227-37, "Reverendissimo in Christo patri Iohanni divina providentia summo pontifici."

Riccard. 1177, 15th century, fols. 7-13, is said to be written at the request of Pope John.

[4] Bibl. Naz. Turin H-II-16, 15th century, fols. 111-115v, "Incipit tractatus de venenis et eorum medicinis appropriatis transmissis summo pontifici Joh. XXII." "Explicit tractatus de venenis et eorum medicinis appropriatis qui pollox (*sic*) venenorum appellatur. Compillatus ab egregio artium et medicine doctore petro de ebano et temporis decano studii montisspessulani directus sanctissimo in Xo patri et domino domino Johanni divina providentia pape XXII. Deo gratias amen." I take this description of the MS from Giacosa (1901), p. 495. The MS was somewhat damaged in the fire of 1904 and in the description of it in the catalogue of MSS which survived the fire, published in the same year, Abano's treatise is not mentioned: "Marsilia Sancta Sophia Receptae super prima quarti Avicennae De febribus; et alia."

Canon. Misc. 46, 15th century, fols. 31-47r, described by Coxe as, "Eiusdem Petri libellus de venenis ad Johannem Papam XXII," but the pope's name does not appear in the MS itself.

[1] Scardeone (1560), p. 201.

[2] Mazzuchelli (1741), p. xlii.

[3] In the fourth chapter or fifth, if, as in most printed editions, the preface is reckoned as chapter one.

Inference from a citation of Avenzoar.

Malik, Abu Marwan) concerning the power of a powdered emerald as an antidote against poison. In the printed editions Avenzoar's work is referred to as that translated for Pope Boniface.[1] If we could only rely upon this as Peter's original wording, it would mean that he was himself addressing some pope later than Boniface VIII (1294-1303), and so would support the other evidence that the *De venenis* was addressed to John XXII. But in at least one manuscript of the *De venenis* the work of Avenzoar is said to have been translated "for the Roman people."[2] Moreover, the Latin translation of Avenzoar in question is extant and in the printed version[3] we read at the close that it was translated at Venice, August 21, 1281, from Hebrew into Latin by a master of medicine from Padua[4] with the aid of a Jew named Jacob. The work would thus seem to have been translated long before Boniface became pope. In a Paris manuscript,[5] however, the translator gives his name as John of Capua, a baptized Jew, of whom we know as a translator of other works from Hebrew into Latin,[6] and addresses his present translation to the archbishop of Braga in Portugal,[7] whom Hartwig believed to be Martin de Oliviera who held that office from 1292 to 1313. Now this John of Capua also translated the work on Diets of Maimonides, at the suggestion of William of Brescia who was Pope Boniface VIII's physician, and Hartwig believes that he met the archbishop of Braga at Rome. But more than this, in a Vienna manuscript the translation of Avenzoar is addressed to Pope Boniface VIII himself.[1] Apparently therefore there is justification for Peter of Abano's speaking of the work as translated for Boniface VIII. And whether it was or not, in any case it was translated at too late a date for Peter to have cited it in his *De venenis,* had that treatise been addressed to Pope John XXI who died in 1277. So if we admit that the *De venenis* was addressed to a Pope John, it must have been addressed to John XXII who became pope on August 7, 1316.

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[1] "Et ego quandoque sum expertus et avenzoar hec invenit ut in libro translato Papae Bonifacio scriptum est." Once in an edition of 1555 the pope's name appears in full, but more often is abbreviated to "pape Bon.," as in the 1521 edition, or "pape Bo." as in the earliest editions.

[2] Addit. 37079, 15th century, fol. 102r, "et avenzoar hec invenit ut in libro populo romano." It is easy to see, however, how the Latin abbreviations for *Papa Bonifacius* and *populus Romanus* might be confused by a copyist. Unfortunately I have not been able to trace this point further in other MSS.

[3] *Liber Theizir Dahalmodana Vahaltadabir,* II, i, 5 (Venice, 1553), for the passage cited on the emerald. There are also editions before 1500.

[4] Can this be meant for Petrus Paduanus himself?

[5] BN 6948, fols. 1-102: see the extracts made from its preface and Explicit by Delisle at the request of Otto Hartwig, in the latter's *Die Uebersetzungsliteratur Unteritaliens in der normannisch-staufischen Epoche,* in *Centralblatt f. Bibliothekwesen,* III (1886), pp. 188-9.

[6] *Ibid.,* p. 187.

[7] It is somewhat of a coincidence that Petrus Hispanus was archbishop of Braga before he became Pope John XXI.

Popes and poisons.

Returning for a moment to Boniface VIII, it may be remarked that he was presumably the pope who, as Peter himself states in the *Conciliator,* had protected him from certain persecutors. That there was nothing strange in addressing a work on poisons to a pope of that time is shown by the fact that Ermengard Blasius (or Blasii) [2] of Montpellier, physician of Philip the Fair of France, translated the work of Moses Maimonides on poisons for Clement V, the predecessor of John XXII, in 1307.[3] But there is no evidence so far as I know to indicate that Peter of Abano addressed his work on poisons to Clement V, although chronologically it is possible.

APPENDIX VIII

PETER AND THE INQUISITION

His own statement in the *Conciliator.*

The relations of Peter of Abano with the church and the Inquisition and the question whether he was accused, tried, or condemned for heresy, magic, or astrology, are matters which have seldom been either carefully investigated or correctly stated, although allusions are often made to these points as if they were definitely settled. We shall inquire here what real evidence there is. In the *Conciliator,* written in 1303, occurs a germane statement by Peter himself at the close of a chapter in which he has discussed the determination of periods in history and the rise of new prophets and religions by the courses of the stars, and the connection of seven angelic intelligences with the seven planets. After this somewhat bold indulgence in astrology Peter concludes, "So much then has been said as can be comprehended by reason concerning this according to the skill of the world's scholars, in no way derogating from divine wisdom in what has been written but rather confirming it in all points since it alone is truth and life. In this matter, however, some mischief-makers, unwilling or rather unable to hear, for a long time have freely vexed me, from whose hands at last the said Truth has laudably snatched me and mine, with the intervention too of an apostolic mandate." [1] Before 1303, therefore, Peter's astrology had aroused considerable opposition, perhaps at Paris, which however was checked at least for the time being by papal protection, and to which Peter does not so far as I know allude again in his subsequent works.

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[1] Hartwig (1886), p. 188, "sanctissimi patris domine pape B. VIII."

[2] See Chapter 68, p. 845, note 2.

[3] Peterhouse 101, 13-14th century, No. III, fol. 6r, "Expl. lib. Rabynoisis cordubensis translatus barthinone a mag. hermengaldo blasii in honorem reverentissimi summi pontificis Clementis quinto (*sic*) anno ab incarnacione verbi 1307."

His professions of orthodoxy.

In many passages of his works, however, Peter recognizes that the Peripatetic philosophy and Christian dogma do not agree, and, while stating the philosophical position, gives his adhesión to the orthodox Faith.[2] In the preface to the *Conciliator* he states that the work is divided into three parts in honor of the Trinity. In the *Addition to Mesuë* he argues that trust in God is of avail in the art of medicine. Pious phrases such as *Si deo placet* and *Deo gratias* occur with fair frequency in his works. Finally, in his will of 1315, or rather in a statement made the day before the will was drawn up, he makes profession of firm faith in the Trinity, Creed, and articles of faith, and declares that he believes "in all respects just as Holy Mother Church believes and teaches," and that he has always so believed and will until his last breath. "And if it should be found that he has ever said anything contrary to the Faith, he said it not because he believed it, but probably for purposes of disputation."[1]

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[1] *Conciliator,* Diff. 9.

[2] See, for instance, *Conciliator,* Diffs. 9, 13, 64, 135, 156.

Does his will show fear of the Inquisition?

There is perhaps no sufficient reason for doubting the sincerity and spontaneity of these professions of faith, but the question arises whether Peter did not make this confession of faith in order to demonstrate that he was no heretic and so secure the validity of the will which he made on the day following. This would be a prudent step on his part if he had any fear of future action by the Inquisition, since the property of a heretic who was condemned to life imprisonment or to the stake was subject to confiscation. Moreover, the number of judgments of confiscation against deceased persons was "relatively high."[2] We now turn to the will itself to inquire if there is anything in it to suggest fear of the Inquisition on Peter's part. The most, if not the only, extraordinary feature of the will is the attitude shown by Peter toward his sons. We have seen that three survived him and were concerned in legal transactions in 1318 and 1321. There is, however, only one or at most two mentions[3] of them in the will. After a list of legacies for various purposes and to various persons, including his nephews and grandnieces, and the bequest of two thousand pounds of back salary to the Commune of Padua, the will continues, "Also he has commended himself, his sons, and his property to the Commune and men of the city of Padua as if it were the tutelage and infallible defense of their own sons and property." Then he names the executors of his will (*suos fideicommissarios*) and as his heirs *Jacobum qu. domini Marsilii de Carrara de Padua* and *Conradum qu. domini Bonzanelli da Viguntia,* whom he describes as "trustworthy men and of eminent virtue and repute." Jacobus became captain-general of Padua in 1318.

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[1] Verci (1787) VII, *Documenti*, 118-9.

[2] CE, "Inquisition."

[3] The doubtful passage is, *"Item reliquit domine Marie quondam Bartolamei a Sancto Gregorio de contrata Sancte Lucie de Padua libras centum parvorum et pro quolibet anno libras vigintiquinque parvorum pro suo labore dispensandi domum et pueros suos dum vixerit."*

The question is, does Peter leave Maria one hundred petty pounds outright and an annuity of twenty-five pounds "for her labor in managing the house and her children as long as she lives," or "for (i.e., in return for) her labor in managing the house and his children as long as she lives"?

The words *"dum vixerit"* must mean "as long as she lives," because they are similarly used in the next sentence of another recipient of an annuity. Could they mean, "while he (i.e., Peter) lived," there would be less difficulty in translating *"pueros suos"* as "his children."

Later legend (Scardeone, 1560, p. 201) stated that Peter had a housekeeper named Marietta who saved his corpse from the Inquisition by hiding it for a time. It is also possible that Maria was Peter's mistress as well as housekeeper, and that the *"pueros suos"* were "their children."

Gloria's inference.

From these passages Gloria concludes that Peter entrusts his body, his children, and his property to the Commune of Padua in order to save them from the Inquisition,—his body from being burned after his death, his property from being confiscated; and that he names "two rich and powerful citizens" as his heirs in order to enlist their aid and with the secret understanding that they shall later transmit the residue of his property, after his other legacies are paid, to his children. It should, however, be realized that the confiscation of the property of a heretic was absolute. "Forfeiture occurred *ipso facto* as soon as the crime of heresy was committed, the heretic could convey no legal title and any assignments which he might have made were void, no matter through how many hands the property might have passed." [1] Whether, therefore, Peter's sons received their inheritance directly or indirectly, it could be taken from them, if he were condemned as a heretic either before or after his death. On the other hand, there is this to be said in favor of Gloria's interpretation of the will. If Peter's property were confiscated as that of a heretic, it would naturally be confiscated by the Commune of Padua, the same secular power to whom he would be handed over for execution in case he were condemned to the stake. By making a generous legacy to the city, by appealing to it for protection of himself and children, and by naming leading citizens as his heirs, Peter may have hoped to enlist public opinion on his side, to prevent any Paduan from accusing him of heresy to the Inquisition or supporting such a charge, or, in case the Inquisition does condemn him and the city government of Padua does confiscate his property, to induce the Commune at least to provide for his children. And certainly the sentence in which Peter entrusts himself, his children, and his goods to the infallible defense of the Commune of Padua does not sound as if he meant to disinherit his sons in favor of other heirs.

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[1] H. C. Lea, *A History of the Inquisition in the Middle Ages,* I, 520.

Did Peter's sons inherit his property?

The next question is: what evidence is there to show that the sons ever received their father's property, if this was his intention? Gloria holds that Peter's sons are called his heirs in documents recording legal transactions of 1318 and 1321, that consequently he meant them to be his real heirs when he drew up his will in 1315, and that the nominal heirs, true to their trust, have duly turned over the estate after the funeral expenses and other legacies have been met. If this last assumption is true and if Peter's sons are in 1318 openly called his heirs, whereas in 1315 he did not dare to call them his heirs, it would appear probable either that there has been in the interval a trial for heresy and that Peter has been acquitted, or that there has been no trial and is not likely to be one. But I am not so sure that the documents mentioned describe Peter's sons as *his* heirs.[1]

If so, how?

If, however, they are openly called his heirs in 1318, or if, whether called his heirs or not, they are in possession of his property after his death, there are other possible explanations of this than that the heirs named in his will of 1315 have voluntarily turned over the estate to them. Either the will may have been set aside for other reasons—it will be noted that at its close Peter states, "if it is not valid by the law of testaments, let it have force and hold by the law of codicils or any other law by which it may the better and more efficaciously have force and hold good." [1] Or the will may have been annulled by the sons, angry at being disinherited, having themselves informed against their father as a heretic. For note the one exception to the law that the confiscation of the property of a heretic is absolute even at the expense of his innocent widow and children. "Frederick II and Innocent IV both decreed that children could inherit their father's property, if they denounced him for heresy." [2] But this sensational possibility [3] seems to be excluded by another bit of evidence which Gloria did not note but which supports his interpretation of the will. In 1325 Marsilius de Carrara, nephew of the Jacobus named as one of Peter of Abano's heirs and almost as prominent as his uncle in the town politics, was knocked off his horse and trodden under foot in a street fight in Padua, and was in danger of his life, but was helped to his feet by "Benvenutus of Abano, son of master Peter, and others of his men." [4] Thus whatever disposition was made of Peter's property, his nominal heirs and his sons seem to have remained on good terms.

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[1] Again it is a question of the translation of a reflexive pronoun. In the passage, "*Benvenutus q. fil. mag. Petri fisici olim ser Constancii de Abano pro se et vice Petri et Zifredi suorum fratrum q. eiusd. d. Petri et suorum heredum vendidit*" (Gloria, p. 587), does "*suorum heredum*" mean Peter's heirs or, like "*suorum fratrum*," Benvenuto's heirs?

The other document of 1321, "*. . . in villa Abani coheret a mane Benvenutus q. magistri Petri de Abano cum Petro et Zufredo fratribus suis*," shows that they have just inherited some property in Abano together, but scarcely from their father who has been dead at least three years according to the other document.

Burning of Peter's bones for heresy.

If Peter's children were provided for, there is evidence that the men of Padua were not equally successful in protecting his corpse from the Inquisition. Thomas of Strasburg, Prior-General of the Augustinian Friars from 1345 to 1357, in his *Commentary on the Sentences*[1] calls Peter a heretic, although he admits that he was a most capable physician. Thomas affirms that Peter denied the miracles by which Christ and the saints raised the dead, arguing that men who were afflicted by a certain disease often fell into a trance for three complete revolutions of the sky. And when asked if Lazarus was not in the tomb four days, he would say that it was only for three full days since the first and fourth days were incomplete. Thomas does not affirm that Peter ventured to deny the resurrection of Christ Himself, but concludes his allusion to Peter by saying, "But in this his iniquity he was deceived and received the reward of his error. For I was present when in the city of Padua his bones were burned for these and his other errors." The inference which has been drawn from this brief statement is that at some time after Peter's death his bones were disinterred and burned. This much may perhaps be accepted as the fact, since Thomas asserts he was an eye-witness, but such gossipy reminiscence as this by medieval monks and friars, especially when heretics or saints are the theme, is notoriously unreliable, as Salimbene and the astounding yarns in Thomas of Cantimpré's work on bees show in the thirteenth century. At any rate Thomas of Strasburg gives no hint that the "other errors" of Peter of Abano were connected with magic or astrology. Indeed Thomas displays a considerable faith in astrology himself in other passages of this work we have cited.[2] He asserts that the sky itself has a real action on inferior objects except for free will. Upon it the stars cannot act directly but they may affect it indirectly owing to the radical union in us of sense appetite and intellectual appetite.

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[1] Verci, VII, *Documenti*, p. 118, "et si non posset valere iure testamenti valeat et teneat iure codicillorum vel quocumque alio iure quo melius et efficacius valere et tenere possit."

[2] E. Vacandard, *The Inquisition*, 1908, p. 246.

[3] It is also barely possible that Peter, in drawing up his will, had planned to have his sons denounce him in order to inherit.

[4] *Chronicon Patavinum*, anno 1325, in Muratori, *Antiquitates* (1778) XII, 252.

It is worth noting that the Chronicle is silent as to any heresy trial or punishment of "master Peter."

A century later Michael Savonarola supplements with

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[1] *Thomae ab Argentina, Commentaria in IIII libros sententiarum*, Genuae, 1585, Book IV, Distinctio 37 and 38, Article 4, which in this edition is vol. II, fol. 171r. This passage has been incorrectly cited by Colle and others, so that I had difficulty in finding it, especially since it is buried under the heading, "De impedimento praecedentis conjugii."

[2] Liber II, Dist. 14, Quaestio I and Artic. III.

The account of Michael Savonarola.

further detail the general impression of trouble between Peter and at least a certain party in the church which we obtained from Abano's own statement and from Thomas of Strasburg, and suggests that Peter's inclination toward magic, or at least reputation for magic, led the Dominican inquisitor to denounce him as a heretic at Paris and try to bring him to prison and the flames. "But he was held in so great veneration by royal majesty and the entire university that means were not supplied the inquisitor to take him." Savonarola goes on to say that, when Peter learned of this, he induced the king and university to call a council of doctors of Holy Scripture, whom he convinced by forty-five arguments that not he but the Dominicans were heretics. "And after sentence had been so given," continues Savonarola, "if the story is to be believed, it was brought about that the Dominicans were driven from Paris as heretics and exiles and were unable to reside there for thirty-two years." [1] But of course we do not believe any such story, which is mentioned nowhere else, and therefore Savonarola's entire account has to be suspiciously regarded as "a story."

Savonarola proceeds to say, however, that then the case was appealed to Rome and that by intervention of the pope peace was at last made between Peter and the Dominicans; and that in his testament, "which is held in great veneration by many Paduans," Peter left his body to be interred among the Dominicans as a sign to God and the world how he had kept the peace with them. As a matter of fact, however, it is in the church of St. Anthony the Confessor belonging to the Friars Minor or Franciscans of Padua that Peter's will directs he shall be buried, while two Franciscans and no Dominicans are listed among the witnesses to his confession of faith. Again therefore we find Savonarola's account unreliable. He concludes, "But the Dominican Inquisitor, full of venom and breaking the truce to which he had sworn—an action the more detestable in a clergyman, in the silence of the night opened the sepulcher, burned the body, and gave the ashes to the wind. O unspeakable crime!"

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[1] Perhaps Savonarola uses the word "Dominicans" here merely in the sense of inquisitors.

Scardeone's account.

As we recede further from Peter of Abano's own time to Scardeone in the sixteenth century, more specific details concerning his life accumulate. Scardeone perverts Savonarola's statement that Peter's astrological predictions won him a reputation as a magician and that this got him into trouble with the Dominicans at Paris, into the assertion that Peter's devotion to mathematical disciplines at Paris caused him on his return to Padua to be suspected of magic. He adds that a rival physician, Peter of Reggio, jealous of Abano's science and fame, reported him to the Inquisition as a heretic and necromancer. That the Inquisition twice instituted proceedings against him: in 1306, when three illustrious men, whom Scardeone mentions by name,[1] were his patrons and, since nothing was proved against him at the trial, he was freed from this calumny; and again in 1315, when he died during the trial—Scardeone, however, says nothing to suggest that this was due to application of torture—and was buried in the church of St. Anthony. The Inquisition, however, went on to condemn him upon the basis of his writings, but meanwhile either his friends or his housekeeper Marietta had removed and hidden his body, which the inquisitors had to be content to burn in effigy. "This," coolly continues Scardeone, "is why Thomas of Strasburg wrote that he saw the bones of Peter of Abano burned in the square of Padua." Thus Scardeone not merely makes new assertions based upon no one knows what, but contradicts statements of Savonarola who was nearer to the events and Thomas of Strasburg who claims to be an eye-witness. It is on Scardeone's account, nevertheless, that most modern allusions to Peter of Abano and his fate are based.

Naudé's statement.

It is hardly worth while to pursue the matter further in later writers except perhaps to note an inscription upon a statue of Peter of Abano in Padua which Naudé mentions in 1625.[1] "Petrus Aponus of Padua, most learned in philosophy and medicine, and on that account winner of the name of Conciliator; in astrology indeed so skilled that he incurred suspicion of magic, and, falsely accused of heresy, was acquitted." Thus only one trial is mentioned and that resulting in an acquittal.

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[1] One of them, Jacopo Alvarotto, was one of the witnesses to Peter's profession of faith in 1315 and one of the executors named in his will.

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[1] *Apologie,* pp. 386-7. Eighty-two statues of "illustrious Paduans and university men" still adorn the Piazza Vittorio Emanuele II (formerly the Prato della Valle) at Padua.

CHAPTER LXXI

CECCO D'ASCOLI

Reasons for his celebrity—An astrologer burned by the Inquisition—Works by Cecco to be considered here—Other sources—The sentence by the Inquisition—Villani's account—The later manuscripts—Astrology for cities—The fate of individuals—Influence of stars and signs—How mind and soul are affected—The stars and dreams—Astrological images—Did Cecco deny human free will?—Founders of new religions said to be born of incubi and succubi at astrological periods—Birth of Christ and darkness during His passion were both miraculous—Christian qualification of Albumasar—Cecco's astrology not the most extreme—Charge that he taught astrological necromancy—His attitude toward magic—His frequent citation of books of magic and necromancy—Necromancy employs evil spirits—Cecco unduly curious rather than heretical in this regard—Was his death due to personal enemies?—His execution of little significance.

Reasons for his celebrity.

THE name of Cecco d'Ascoli has perhaps received more attention and is better known than the writings and actual achievements of its owner deserve. If so, this is mainly for two reasons; first, that his poem *l'Acerba* has been associated with the study of Dante; second, that he was condemned by the Inquisition and burned at the stake in Florence in 1327. Doubtless Cecco should receive some attention in the histories both of literature and science as one who was both an Italian poet and a Latin teacher and writer of astronomy and astrology. But his works and personality would perhaps have been long since forgotten but for the fact that his learned poem, *l'Acerba,* was taken to be an invidious parody of Dante's *Divine Comedy,* and that both it and his astrological work in Latin were ordered to be burned at the same time with himself, while all persons retaining copies of them were to be excommunicated. Recently, it is true, it has been held that Cecco imitated Dante out of admiration for him and not from any desire to cast aspersion upon the *Divine Comedy*,[1] but in any case their names have long been coupled. As for the condemnation by the Inquisition, its chief effect seems to have been to raise a rather ordinary astrologer to the position of a martyr for science and a reproach to the medieval church. Many apologies for and eulogies of Cecco have been penned through the centuries since, while a few writers have tried to justify the action of the Inquisition, to discredit Cecco, and to question his scientific reputation.[2] Certainly the condemnation by the Inquisition seems to have advertised rather than repressed his writings, since not only has the poem *l'Acerba* survived but also two works on astrology. Of these three the two that the Inquisition probably meant to forbid were both in print before 1500 and the Protestant Revolt. The third, which the Inquisitors seem to have overlooked, was also neglected by publishers until the present century.

An astrologer burned by the Inquisition.

Hitherto in our survey of medieval learning, more particularly of the twelfth and thirteenth centuries, we have found little or no evidence in support of the old view, or rather assumption, that every medieval scientist was persecuted by the church. Signs of a theological party hostile to the growing interest in natural science we have seen, but much more evidence of this growing interest itself, and that too among bishops, friars, Franciscan as well as Dominican, and even popes. We have seen that the scientific attitude of William of Conches prevailed in the long run, that it is very doubtful if Roger Bacon was in any sense persecuted by the church for devotion to natural science, and that Peter of Abano did not have to die in order to escape the Inquisition but that it had to wait until after his death before it could do him any harm. But now in Cecco d'Ascoli we come at last, and it is not until the fourteenth century, to a well authenticated case of an astrologer of some learning being put to death through the agency of the Inquisition. This makes his writings the more important for us to note, although we do not find their contents such as to entitle him to any high rank as a natural scientist.

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[1] G. Castelli, *La vita e le opere di Cecco d'Ascoli*, 1892, chapter 12.

[2] For an account of this literature see Castelli's opening chapters.

The important contributions of G. Boffito will be mentioned presently. W. St. C. Baddeley, *Cecco d'Ascoli, Poet, Astrologer, Physician*, 1894, is a worthless popular essay.

Works by Cecco to be considered here.

It is hard to see any reason for the condemnation of *l'Acerba* by the Inquisition except that it was written by Cecco. Its superstition is so slight as not to call for notice here, nor is its natural science more remarkable than that of other vernacular poems such as the *Romance of the Rose.* Our discussion will center about his two extant Latin works which are in the form of commentaries upon the *Sphere* of Sacrobosco [1] and the *Principia* of Alcabitius.[2] Both seem to be in the form of class-room lectures and were presumably delivered by Cecco at Bologna. As we shall see, it is reasonably certain that the Latin work condemned by the Inquisition was the commentary on the Sphere and not that on Alcabitius, although why the latter should be overlooked when the innocuous *l'Acerba* was condemned is difficult to explain except by the usual ignorance and stupidity of censors and persecutors. It is unlikely that either of the Latin works has been altered from Cecco's original either by himself or others in order to render it less objectionable from the theological point of view, after the Inquisition had condemned his book on astrology *in toto.* It would be more likely if anything to be touched up in the other direction. In any case these two works are what we have from Cecco's pen to show what were the views of an astrologer condemned by the Inquisition.

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[1] *Sphera Mundi cum tribus Commentis nuper editis videlicet Cicchi Esculani, Francisci Capuani de Manfredonia, Iacobi Fabri Stapulensis. . . . Impressum Venetiis per Simonem Papiensem dictum Bivilaquam,* 1499. As the leaves are unnumbered in this edition, the following references will follow the foliation of the 1518 edition, *sphera cum commentis,* etc., which will be cited as *Sphera.*

BN 7337, 15th century, pp. 32-41, *Caeci Aesculani super sphaeram,* seems to contain only portions of Cecco's commentary and to omit Sacrobosco's text entirely.

[2] *Il Commento di Cecco d'Ascoli all' Alcabizzo,* edito a cura del P. G. Boffito, 1905. This will be referred to as *Alcabizzo.*

Other sources.

We have, it is true, some documentary evidence other than Cecco's own works to show what his views were and why he was condemned by the Inquisition, but it is not very satisfactory. Boffito, who in recent times has made the most specialized study of Cecco d'Ascoli and his works, editing the commentary on Alcabitius hitherto unprinted and investigating the problem, "Why was the astrologer Cecco d'Ascoli condemned to be burned?" [1] accepts outside of Cecco's own writings only two sources as at all original and reliable, namely, the account in Giovanni Villani's contemporary chronicle [2] and a Latin manuscript in the Riccardian library at Florence [3] which contains a summary of the inquisitorial sentence against Cecco. This manuscript is on paper and I should say is certainly not earlier than the fifteenth century. Boffito views with suspicion the longer sentence in Italian which was reproduced by Cantù [4] and made use of in Lea's *History of the Inquisition,*[5] since it is not found earlier than in a manuscript of the seventeenth century.

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[1] *Studi e Documenti di Storia e Diritto, Publicazione periodice dell' accademia di conferenza Storico-Giuridichi, Roma,* XX (1899), 357-82, *"Perchè fu condamnato al fuoco l'astrologo Cecco d'Ascoli?"*

[2] Muratori, *Scriptores,* tome 13, X, 39-40.

[3] Riccard. 673 (M-I-25), fol. 111r-v, "De magistro Cecco de asculo quare combustus sit."

[4] *Gli Eretici d'Italia,* Turin, 1865, I, 151.

[5] H. C. Lea, *A History of the Inquisition of the Middle Ages,* III, 444.

Lea's sources for his account of Cecco would seem somewhat dubious from his own description of them, since he says, "I owe many of the above details to a sketch of Cecco's life in a Florentine MS which I judge from the handwriting to be of the seventeenth century and of which the anonymous author appears to be well informed; also to a MS copy of the elaborate sentence, much more full than the fragments given by Lami and Cantù. Lea supplied no further means of identifying these MSS, but presumably he had reference to two of the following:

Poppi 199, 18th century folio, *Vita e morte di Cecco d'Ascoli.*

Panciatichiani 117, 18th century, p. 50—*"Abiura di Cecco d'Ascoli e sua morte seguita in Firenze l'anno* 1328, *con altre notizie appartenenti alla sua vita." Precede una nota sul padre Accursio Buonfantini Inquisitore, che esaminò e condannò Cecco d'Ascoli;* pp. 51-9, *Esame e condanna di Cecco d'Ascoli, "Al nome de Dio amen. Noi frate Accursio . . . / . . . Familiari e servitori dell' Inquisizione e molte altre persone";* pp. 60-3, *Memorie della vita e morte di Cecco d'Ascoli, "Nella città d'ascoli nella marca fu un artigiano assai commodo . . . / . . . che troppo dalla credenzia della vera fede si allontanano";* pp. 63-4, *Altre notizie date dal Sig. A. M. Manni, "Maestro Cecco fu cittadino ascolano, filosofo et astrologo . . . / . . . delle Virtù delle Pietre, manoscritto del sig. Alessandro Cherubini."*

The sentence by the Inquisition.

According to the Riccardian manuscript Cecco's astrology was the reason, or at least the pretext, for his condemnation, but it does not make clear just what was found objectionable in his astrological teaching. It brings out further, however, that he was not put to death for a first offense but was burned at Florence as a relapsed heretic on the ground that he had violated the terms of a previous sentence imposed upon him by the inquisitor at Bologna. In 1324 the Bolognese inquisitor had found Cecco guilty of improper utterances concerning the Catholic Faith and had imposed upon him a penance of fifteen days of confession, daily recital of thirty Paternosters and as many Ave Marias, occasional fasting for a year, and the hearing every Sabbath of a sermon by the friars. He furthermore took from Cecco "all his astrological books, great and small," forbade him ever again to teach astrology at Bologna or elsewhere, publicly or privately, deprived him indefinitely of his professorial chair and doctor's degree, and fined him seventy pounds Bolognese. Taken altogether, this sentence, while it did not condemn Cecco to death, would seem to have deprived him rather effectually of future means of livelihood. Three years later the inquisitor at Florence received the account of the foregoing process against Cecco at Bologna, summoned him before himself, pronounced him a heretic, and handed him over to the secular arm to be burned at the stake. This part of the sentence was duly executed by the ducal *Vicarius,* Lord Jacob of Brescia. It was further decreed that Cecco's astrological book in Latin and his poem

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Palat. 895, 17th century, carte 15, *Sentenzia contro a maestro Cecco di maestro Simone degli Stabili da Ascoli, data in Firenze l'anno di nostro Signore* 1328, *"Noi frate Accursio di Firenze, dell' ordine de' frati minori, per autorità appostolica Inquisitorre della eretica malignità della prouincia de Toscana . . . / . . . come in Firenze è pubblico e notorio per l'euidenza del fatto manifesto."*

Castelli, p. 42, says that the number of copies of the sentence and relation of the death of Cecco found in the libraries of Italy is incredible, but he mentions only two.

l'Acerba in Italian should be burned and that all persons retaining copies of them should be excommunicated.

Villani's account.

Villani adds a number of further details. He states that it was the *Commentary on the Sphere* which had caused Cecco's condemnation at Bologna, that he had been forbidden to make further use of it, and that at Florence it was charged that he had violated this prohibition. But Cecco denied this and attributed his arrest at Florence to the hostility of a Friar Minor who was both bishop of Aversa and chancellor to Charles of Calabria, who was at that time duke of Florence and whose astrologer Cecco seems to have become after leaving Bologna. In this new position, Villani says, Cecco had made many true predictions of political events, but although a great astrologer he was a vain man and of worldly life. The friar-bishop-chancellor regarded Cecco's presence at Florence as court astrologer as an abomination. Villani, however, like Cecco himself, does not appear to regard his practicing astrology at Florence as necessarily a violation of the decree of the inquisitor at Bologna; but if the Riccardian manuscript correctly reproduces the Bologna sentence, Cecco would certainly seem to have violated it. Villani volunteers more information than the Riccardian manuscript as to the respects in which Cecco's teaching or practice of astrology was found objectionable. He makes the general assertion, which is too vague to be of much value, that Cecco was too bold in exercising his science in things prohibited and untrue, "since the influence of the stars does not constrain of necessity" nor against human free will and divine prescience. Villani, indeed, perhaps added this qualification, after having stated that Cecco made many true political predictions, in order to save himself from possible censure. But he more specifically states that Cecco ascribed the force of necessity to the stars; that in his treatise on the *Sphere* he asserted that there were evil spirits generated in the sky who could be coerced by incantations under certain constellations to perform many marvels; and that he taught that Christ came to earth in accordance with the will of God and with the principles of astrology, and ought from his nativity to live with His disciples *come poltrone* and to die the death that He did, while Antichrist would come according to the courses of the planets in rich raiment and power. Cecco also, Villani vaguely adds, taught "many other idle things and contrary to the Faith."

The later manuscripts.

The later manuscripts incorporate these charges of Villani in the inquisitorial sentence against Cecco, using suspiciously similar wording in the passage concerning Christ and Antichrist, and charging that Cecco has taught his work on the *Sphere* in the schools contrary to his promise and oath. These manuscripts further assert that Cecco has confessed to teaching publicly that men born under certain constellations must necessarily be rich or poor or decapitated, that God would not change the course of nature, and that in the fourth and eighth sections[1] of his *Commentary on the Sphere* he said that under certain constellations happy divine men would be born like Moses, Hermes, Merlin, and Simon Magus. Like Villani the later manuscripts mention Cecco's political predictions at Florence and state that he had prophesied concerning "the Bavarian."[2] They also mention the stress laid by Cecco upon the importance of the constellations that cities are founded under. Such of the statements of these late manuscripts[3] concerning Cecco's astrological teachings as are not found in Villani will be found to rest upon certain passages in his own works or upon a misapprehension of them.[4] They also mention his *Commentary on Alcabitius,* whereas the older form of the sentence condemns only one Latin book on astrology by him.

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[1] Cecco's *Commentary* is not divided into such sections in the two editions and MS which I have seen.

[2] *"del Bavaro";* the illusion is presumably to the emperor, Louis of Bavaria.

[3] Listed above, p. 951, note 5. Panciatich. 117 is very similar to Palat. 895, but the wording is not identical, and from fol. 56v on the former omits much of the diffuse moralizing of the latter on how wicked it is to pry into the future and to destroy faith in freedom of the will, the basis of all morality (see Palat. 895, fol. 9r-v).

[4] Such as ascribing to Cecco views which he cites from other authors only to condemn immediately.

Another suspicious circumstance about the longer form of inquisitorial sentence preserved in these late manuscripts is that the Inquisition is represented as itself condemning Cecco to death [1] instead of handing him over to the secular arm.

Astrology for cities.

Let us next turn to Cecco's two commentaries in Latin and see what foundation there is in them for the astrological teachings ascribed to him by Villani and the longer form of inquisitorial sentence preserved only in very late and suspiciously worded manuscripts. It is true that Cecco emphasizes the control exercised by the stars over the fate of cities. The laying of the first stone of a city is a moment as influential over all its future history as is the date of conception in the case of an individual. Romans and Tuscans are so corrupt because of the ascendancy of Venus over them, the Lombards are scientific through the influence of Mercury.[2] If cities are to endure, they should be built under the fixed signs.[3] It is best for a man to live in a city with the same guiding star as his own planet.[4]

The fate of individuals.

In the notes which I took on the astrological statements in Cecco's commentaries there seems to be no single direct assertion that under certain constellations men *must necessarily* be rich or poor or decapitated. Cecco does tell his students, however, "You ought to know another thing, that when Jupiter is in the signs of Mars, forsooth Aries or Scorpion, the person born will be bound with the girdle of poverty, infamous, and injured by the powerful.[5] The word "decapitated" perhaps is reminiscent of an anecdote which Cecco tells in discussing the fulfilment of dreams and their dependence on the constellations. A certain malefactor went to a meadow with his associates with a scythe to cut down grass and saw beetles rolling up dung in the road. This reminded him of a dream which he had had the night before that these beetles would decapitate him, and he started in to kill them. But as he struck at them with the handle of the scythe, the blade which was over his own neck cut off his head. "And the moon was in Taurus in conjunction with the fixed star which is called Aldebaran; such is the story told me by my master whom may God pardon."[1] This conjunction, however, would seem to have been that prevailing when the malefactor had his dream and not the constellation under which he was born. Cecco in another passage, however, not only cites Zael to the effect that a horoscope when Mars is lord of the ascendant and in a favorable angle of the sky bestows power and dignity along with impiety and the greatest cruelty, and, unless he is regarded by some favorable planet, will cause the possessor of the horoscope to lose his power soon; but Cecco also adduces the recent tyrant of Ascoli, John Venibene, as a specific example who ruled for three years very cruelly and then was expelled and died abroad.[2] In the case, on the other hand, of a constellation under which are born lords of the whole earth, such as emperors, kings, and princes, Cecco warns that the sons born to peasants in this constellation will not become kings but simply leaders among men of their class, "since the intractability of the material weakens the celestial force" and "the vices and virtues of the parents are transmitted to their heirs."[3] Elsewhere he states that certain planets called superior are especially appropriated to kings, nobles, and magistrates, while the inferior planets signify concerning the populace.[4]

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[1] In Palat. 895, for instance, fol. 12v, *"Deliberarono condannare alla morte il detto maestro Cecco"*; fol. 13v, *"lo condanniamo alla morte come merita."*

[2] *Sphera*, fol. 11; BN 7337, p. 33. Cecco also uses the inhabitants of Ferrara and Bologna to illustrate his point. Each city or state, however, has a triple influence exerted on it by the stars, according to its climate, its province, and the moment of its building. See also fol. 14.

[3] *Alcabizzo*, ed. Boffito (1905), pp. 31-2.

[4] *Ibid.*, 53-4.

[5] *Ibid.*, pp. 58-9.

Influence of stars and signs.

Cecco grants that the celestial bodies are inanimate but holds that by virtue of their substances and the mediation of the intelligences moving them they "have properties in different parts of the sky in which they are said to rejoice and sadden effectively in us, that is, by disposing us to good and to evil." [1] Cecco believes that each herb has its appropriate planet and sign, and that doctors should be careful to note the positions of planets in administering herbs.[2] The parts of the human body and regions of the globe he also parcels out among the signs.[3] In connection with the common topic of the influence of the stars upon the formation of the child in the womb he makes the less common observation that sometimes the influence of the stars is too strong, as is seen in the case of infants who talk when only two months old or have marvelous discretion beyond their years —or rather, months—and die young.[4]

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[1] *Alcabizzo*, p. 31.
[2] *Sphera*, fol. 20; BN 7337, p. 37.
[3] *Alcabizzo*, pp. 9-10.
[4] *Sphera*, fol. 11.

How mind and soul are affected

The heavens influence the human mind as well as body, therefore. The stars alter the elements, through these our bodies, and through these our souls.[5] Certain signs of the zodiac are called human or rational "because they dispose man to reason" and "he will possess eloquence mingled with reason." A person who is born under one of the vicious and tortuous signs, namely, the ram, crab, bull, scorpion, and goat, will have a tortuous and vicious disposition, plotting evil and detracting from others, such a person as the physician Gualfridinus, by which name, as Boffito has already suggested, Dino del Garbo, the noted medical writer of Florence, is probably indicated. When the moon is in one of the common signs, Gemini, Virgo, Sagittarius, or Pisces, persons who make advances to you are liable to prove fraudulent; marriages contracted then are liable to be dissolved; if one escapes from prison, it will be only to be retaken; but if one is accused of some crime, he will soon be acquitted; and so on. In some signs secrets will be kept, in others immediately revealed. When the moon is in the first *facies* of Scorpion, all news reports are false.[6] The influence of the stars explains the puzzling fact, concerning which his fellow-townsmen of Ascoli have often questioned Cecco, why a man will choose a silly girl of low birth as his wife rather than another who is more beautiful, noble, and intelligent. The answer is that when the stars of two persons come into certain positions relative to each other, love which cannot be dissolved except by death results, regardless of beauty and social rank.[1]

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[1] *Alcabizzo,* p. 20.

[2] *Ibid.,* 23-4, 49-50.

[3] *Ibid.,* 50.

[4] *Ibid.,* p. 23.

[5] *Sphera,* fol. 7, " . . . elementa alterant complexiones, complexionibus alteratis alterantur animae que in nobis sunt quia anime consequuntur corpora ut dicit philosophus in principio sue physionomie."

[6] *Alcabizzo,* pp. 32, 43, 46-8.

The stars and dreams.

Cecco also ascribes the prophetic quality of dreams to astrological influence, which permits the union of the soul of the dreamer with the superior intelligences or spirits of the sky. Such revelation is, however, impressed upon the soul of the dreamer "under some similitude or figure." Dreams come true when the moon is in the fixed signs, Taurus, Leo, Aquarius, and Scorpio; when the moon is in the common signs, dreams are partly true and partly false. The length of time to elapse before the dream is fulfilled can also often be determined. Cecco says that "minds ill-constituted and false and homicidal do not have true dreams because they are indisposed to receive the action of the intelligences." Robbers and homicides may, however, have true dreams prophetic of their own deaths as in the tale of the malefactor, the beetles, and the scythe already recounted, and in the case of a native of Ascoli whom Cecco knew personally and "who was named Angelus and consequently was a devil." Dreaming when the moon was in Leo that he would be hanged in Roman territory, he became so frightened that he turned friar, but after two years was dismissed from the Order, went to Viterbo, robbed a man, and was there hanged for it.[2]

Astrological images.

Cecco alludes to astrological images twice in his commentary on the *De principiis* of Alcabitius. To illustrate how images work which are made as love charms, or to gain honor, and the like, he states that if an image for purposes of love is made in the hour of Venus when that planet is in Pisces or in Taurus, as the tin is poured out it acquires under the moulding influence of that constellation the due proportion of the elements essential to produce the desired property.[1] Later Cecco tells us of an image which Vergil made at Naples to drive away flies. When the second *facies* of Aquarius is in the ascendant an image of a fly should be engraved on the stone in a ring.[2] In his *Commentary on the Sphere* Cecco even goes so far as to tell how to construct an astronomical image which will enable one to receive responses from demons.[3]

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[1] *Alcabizzo*, pp. 34 and 36.

[2] *Ibid.*, 29-31.

Did Cecco deny human free will?

Returning to the charges made against Cecco's astrological teaching by Villani and the later manuscripts, especially the assertion that he ascribed necessity to the stars, we have to note that, although many of the astrological teachings just listed may seem to ascribe something closely approaching to necessity to the stars, nevertheless Cecco expressly asserted that he believed in freedom of the will. Many of the statements from his commentaries which we have thus far presented are cited by him from Ptolemy, Hermes, Zaël and other astrological writers, and perhaps are not always to be taken as his own opinion, especially when he quotes Hermes as saying, "The heavens are the cause of moral virtues and of all."[4] At any rate he now informs his students that according to "our and the true Faith" the circle of the zodiac, "though it may be the cause of life, yet is not the cause of our will or intellect except as a tendency (*nisi dispositive*), and so I hold and truly believe, although other astrologers hold the contrary, saying that all things which are generated and corrupted and renovated in the inferior world of generation and corruption have efficient causes in the superior world which is ungenerated and incorruptible. . . . That argument I will overthrow in my glosses to the *Centiloquium*"[5]—a work by Cecco which seems to have been lost or never completed.

The charge that in his *Commentary on the Sphere* Cecco said that under certain constellations happy divine men would be born like Moses, Hermes, Merlin, and Simon

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[1] *Alcabizzo*, p. 26.

[2] *Ibid.*, p. 43.

[3] *Sphera*, fol. 18.

[4] *Ibid.*, fol. 4; BN 7337, p. 32.

[5] *Ibid.*, fol. 12.

Founders of new religions said to be born of incubi and succubi at astrological periods.

Magus, and that Christ and Antichrist were alike under the rule of the stars, appears from the text of the Commentary as it has reached us to be an unjust one. Cecco, it is true, quotes Hipparchus in the book on hierarchies of spirits to the effect that in the *coluri,* or circles whose purpose according to Sacrobosco is to distinguish the solstice and equinox, there are incubi and succubi by whose virtue there are born in a major conjunction as if from the deity men who seem divine and who establish religions in the world and work miracles. Such a man was Merlin and such an one will be Antichrist who will be conceived by a virgin and work many miracles.[1] Of Antichrist Cecco promises to say more at the close of his lecture and he there quotes a treatise by Zoroaster on quarter-revolutions of the eighth sphere. According to this Pseudo-Zoroaster, whenever the eighth sphere completes one quarter of a revolution, which happens once in twelve thousand years, there are born by the virtue of incubi and succubi men supported by divinity who introduce new religions and by whose death even the heaven is perturbed. At the end of twelve thousand years the Mosaic law was terminated thus by the Christian religion, and "ours would be terminated in this way by Antichrist." [2] But Cecco does not necessarily subscribe to these statements of Hipparchus and Zoroaster. Indeed he has already declared the art of the latter contrary to the Christian faith and he now continues, "Whence that beast Zoroaster and some following him say that Christ was born under the dominion of those quarter-revolutions from the virtue of incubi and succubi, of whom I have spoken to you above, but it seems horrible to me even to write such words." [3]

Cecco goes on to affirm that "Christ our Lord" was the true son of God who came into the glorious Virgin and was not made by the nature of the celestial bodies. That He

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[1] *Sphera,* fol. 14; BN 7337, p. 34.

[2] *Ibid.,* fols. 22-23; BN 7337, p. 39.

[3] "Unde iste bestia zoroastes et aliqui eum sequentes dicunt quod Christus fuit ortus in dominio istarum quartarum ex virtute incuborum et succuborum de quibus supra dixi vobis quod horribile mihi videtur scribere ista verba."

Birth of Christ and darkness during His passion were both miraculous.

rather was the Maker of celestial natures many things show us. One is that the Magi, who were superior astrologers and acquainted with the secrets of universal nature, adored him as king and son of God, seeing this in the star which appeared to them with the figure of a crowned child beneath it.[1] Cecco also argues that the period of darkness during Christ's passion was a true miracle and not due to a natural eclipse, nor to the interposition of a comet called Milex, nor to the occult virtue of the stone heliotrope. The comet Milex is supposed to presage religious change and injury to kings and potentates, but Cecco argues that its interposition would not cut off the sun's light and further that it is not found at the altitude necessary to interpose. The stone heliotrope is green with blood-colored drops, and when it is placed in a shell full of water in the rays of the sun, vapors arise from it which obscure the horizon in that city. Cecco does not dispute this occult virtue in the gem, which is commonly called "orfanella" and which renders a man invisible by affecting the eyes of others. But he argues that the eclipse during Christ's passion was universal and not confined to the city of Jerusalem. Some say that an interposition of Venus and Mercury caused the darkness, but Cecco affirms that this would be astronomically impossible and in itself a miracle and subversion of natural order. Cecco, however, adds that while miraculous, the eclipse was also in a sense natural, since God is the First and Universal Cause and can alter the heavens which are a secondary universal cause.[2]

Christian qualification of Albumasar.

Cecco also pretends that where Albumasar speaks of *creatio* as the work of the stars, he must really mean *generatio,* since the act of creation pertains to God alone, although generation is under the stars.[3] As for Albumasar's aphorism, "If anyone asks anything of God when the head of the dragon is in conjunction with Jupiter and the moon in mid-sky, his prayer will be fulfilled"—which Peter of Abano said he had tested twice with success; Cecco declares that it is not proper to interpret this as meaning that prayers to God will be infallibly answered in certain constellations, but that the word *deus* is to be taken here as indicating the king or other chief magistrate in the state.[1] Thus Cecco seems at considerable pains to say nothing that might be offensive to the church, and he closes his *Commentary on the Sphere* with the statement that if in it or other writings of his aught is found to criticize, he will gladly submit it to the correction of the very holy Roman church. Possibly this remark and others like it represent a revision of his works undertaken after his first condemnation at Bologna. According to one of the late manuscripts,[2] Cecco, when summoned before the Inquisition at Florence, claimed that his book had been corrected by the inquisitor of Lombardy. This defense was not allowed, however, and the terms of the sentence at Bologna would seem to preclude it. And since the sentence given at Florence absolutely forbade anyone to possess the book, there does not seem much reason why a revised rather than the original version should survive.

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[1] BN 7337, p. 39.

[2] *Sphera,* fol. 23.

[3] *Alcabizzo,* p. 49.

Cecco's astrology not the most extreme.

On the whole, then, it would be surprising if Cecco's condemnation were due merely or primarily to his astrological teachings. As Tiraboschi[3] noted nearly one hundred and fifty years ago, he upholds human free will, though attributing to the stars a natural inclination to vice or virtue, and holding other superstitions common to the astrologers of his time. Tiraboschi also noted his submissive tone to the church and was unable to see in the *Commentary on the Sphere* the errors which had been charged to Cecco's account. More than this, in a number of respects Cecco did not go as far as some of his predecessors or subsequent writers. Christ and Antichrist had been partially subjected to the stars by writers before him who do not seem to have been assailed by the Inquisition for their views, and Pierre d'Ailly, the great cardinal and reformer, went much farther in this direction than Cecco in the next century. Peter of Abano had held views concerning the influence of the constellations on the appearance of new religions and on prayers to God which Cecco rejects. But all in vain the concessions made to the Christian standpoint by Cecco at the expense of astrological doctrine; of him alone we know surely that he was condemned by the Inquisition, and he went to the stake.

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[1] *Alcabizzo*, p. 17. In the *Sphera*, fol. 22 (BN 7337, p. 15), he had promised to treat of this matter in the commentary on Alcabitius' *De principiis*.

[2] Palat. 895, 17th century, fols. 10v-11r.

[3] Tiraboschi (1775), V, 165.

Charge that he taught astrological necromancy.

We have not yet, however, discussed Villani's charge that in his *Commentary on the Sphere* Cecco asserted that there were evil spirits generated in the sky who could be coerced by incantations under certain constellations to perform many marvels. Villani perhaps has reference to the passage in which Cecco gives astronomical directions to be followed by anyone who wishes to make an image by means of which he may receive responses from spirits.[1] There is indeed a good deal of information concerning spirits in the heavens in Cecco's commentary on Sacrobosco's manual, and he shows a wide acquaintance with books of magic. We turn, therefore, from his astrology proper to his attitude to magic and to astrological necromancy.

His attitude toward magic.

Cecco's attitude to magic so-called is the usual one of condemnation. He repeats that Zoroaster was "the first inventor of the magic art," and gives a classification of the magic arts almost identical with that of Hugh of Saint Victor, but states that he derives it from the *Liber de vinculo spiritus* of Hipparchus, a book of necromancy. Cecco says that magic is "emphatically censured by holy mother church," [2] and he does not directly question or qualify this condemnation. He says nothing of a natural magic which is harmless. His chief concern with magic, as in the cases of Michael Scot and Peter of Abano, seems to be to distinguish astrology from it as a reputable science, and to hold that one can learn of the future better as well as more legitimately by astrology.

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[1] *Sphera*, fol. 18.

[2] *Ibid.*, fol. 3, "a sancta matre ecclesia vituperabiliter improbata."

His frequent citation of books of magic and necromancy.

The fact, however, that the church disapproves of magic and "vituperates" it, does not restrain Cecco from frequent citation of books of magic, such as the *Liber artis magicae* of Apollonius,[1] nor from retailing to his students much information concerning spirits in the sky and necromancy. Thus when Sacrobosco mentions the four points of the compass, Cecco is reminded of a statement in the *Liber de ordine intelligentiarum* of Hipparchus that certain princes of the demons "occupy the four parts beneath the sky. For expelled from heaven, they occupy the air and the four elements." [2] When Sacrobosco speaks of the zenith and poles in a purely astronomical way, Cecco again quotes Hipparchus as saying, "O wonderful zenith and godlike nature," [3] etc., after the manner of an invocation, and Solomon in the *Liber de umbris idearum* as exclaiming, "O arctic Manes! O antarctics propelled by divinity! Why do natures so great and noble seem to be enclosed in mineral species?" This last remark, Cecco explains, refers to the responses given by these spirits in metal mirrors.[4] When Sacrobosco treats of climates, Cecco remarks that the word may be understood necromantically as well as astronomically. Zoroaster, the inventor of the magic art, uses the word in the necromantic sense when he says, "For those climates are to be marveled at, which with flesh of corpses and human blood give responses trustworthily." "By this," continues Cecco, "you should understand those four spirits of great virtue who stand *in cruciatis locis,* that is, in east, west, north, and south, whose names are Oriens, Amaymon, Paymon, and Egim,[5] spirits who are of the major hierarchy and who have under them twenty-five legions of spirits each. Therefore because of their noble nature these seek sacrifice from human blood and likewise from the flesh of a dead man or cat.[2] But this Zoroastrian art cannot be carried on without great peril, fastings, prayers, and all things which are contrary to our Faith."[1]

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[1] Or *Liber de angelica factura,* (or perhaps *factione*) as it is called in BN 7337, p. 35.

[2] *Sphera,* fol. 15; BN 7337, p. 34.

[3] *Sphera,* fol. 20.

[4] *Sphera,* fol. 17.

[5] In BN 7337, p. 37, these names are spelled, "Orion, Agimon, pagimon, et egin."

[6] *"vel gatti"* in the printed text; *"vel capti"* in BN 7337.

Necromancy employs evil spirits.

This last word of warning may seem a bit belated and perhaps somewhat perfunctory, but shows Cecco still consistent in recognizing that magic and necromancy are contrary to the Christian religion. In other passages he calls these spirits demons and diabolical,[2] and affirms with Augustine that "spirits who are outside the order of grace" cannot truly transmute bodies, nor raise the dead, nor do any marvels and feats of magic except those which can be accounted for by the occult virtues of nature.[3] And in speaking of a demon named Floron, who was mentioned by Solomon in the *Book of the Shadows of Ideas,* who was of the hierarchy of cherubim, who was confined in a steel mirror by a major invocation, who knew many secrets of nature, and who deceived King Manfred and others by ambiguous oracles in modern times,—Cecco concludes, "So beware of these demons because their ultimate intention is to deceive Christians to the discredit of our Lord Jesus Christ." Cecco tells a story of a man of Ferrara who consulted this demon Floron as to hidden treasure and was told that he would find enough in a certain spot to last him for the rest of his life. He dug in the cavern indicated and uncovered only four ounces of gold, but as an avalanche crushed him immediately afterward, the oracle was fulfilled.[4] Yet on the next page we find Cecco giving the instructions already mentioned for making an astronomical image in order to obtain responses from a spirit. And several pages further on he cites a response of this same Floron as to the time when demons are least liable to deceive one and when as a consequence it is best to consult them, and again as to the divinity of Christ, of whom this demon Floron said, "He took upon Him human flesh that all flesh through Him might be saved."[5]

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[1] *Sphera,* fol. 21.

[2] *Sphera,* fols. 17 and 22.

[3] *Sphera,* fol. 16.

[4] *Sphera,* fol. 17; BN 7337, p. 35.

[5] *Sphera,* fol. 22; BN 7337, p. 39.

Cecco unduly curious rather than heretical in this regard.

Thus, much of Cecco's work seems less a commentary upon Sacrobosco's text than a manual of astrological necromancy. His citations from the books of magic and necromancy well illustrate those relations between astronomy, magic, and necromancy to which we have before had allusions in the writings of Albertus Magnus and elsewhere. We remember the distinction drawn in the *Speculum astronomiae* between commendable works of astronomy and injurious works of necromancy, and we wonder if the cause of Cecco's condemnation may not have been that instead of sticking to the field of astrology he made these dangerous excursions into the subject of necromancy. It might well be held that he was leading his students into temptation by the numerous references to demons, the magic art, and astrological necromancy in his *Commentary on the Sphere*. At the same time it must be remembered that such pillars of the Christian Faith and learning as William of Auvergne and Albertus Magnus had read and cited books of magic and necromancy. Cecco's passages concerning astrological necromancy are almost all quotations or citations from other authors. When he speaks in his own name it is usually to declare magic and necromancy contrary to Christianity and to censure the passages which he has just cited. Moreover, the notion of hierarchies of spirits, of their presence in sky and air and elements, of their power to work marvels,—all these were orthodox enough Christian doctrines. And Cecco does not, like William and Albert, hint at a natural variety of magic apart from demons which is not idolatrous and unchristian. Of indiscreet curiosity concerning such matters and undue mention of them he might be found guilty, but scarcely of any direct heresy so far as his extant written works are concerned.

Was Cecco's death due to personal enemies?

If neither Cecco's astrology nor his citation of books of magic and necromancy seems sufficiently extreme to account alone for his condemnation by the Inquisition, we may perhaps find the clue in the hypothesis of personal enemies, which has already been more than once advanced by writers on Cecco. That he would have made bitter personal enemies one can well imagine from the sharp personalities in which he indulges in his works. That such personalities were not unwelcome to the taste of that time, however, is indicated by Dante's frequent allusions to the recent dead in his *Inferno*. Cecco with less discretion directed his gibes against the living. Thus he states that the head and tail of the dragon are the intersections of circles, and not stars forming the shape of a dragon in the sky "as a certain physician of ours of Ascoli (?) argued together with his mother who was as big a fool as himself."[1] We have already mentioned Cecco's insulting words concerning the physician Gualfridinus, who seems the same as Dino del Garbo. Now while Villani tells us that Cecco attributed his arrest at Florence to the chancellor of the duke, in the very next chapter, in mentioning the death of Master Dino del Garbo, whom he calls a very celebrated physician and a man learned in natural science and philosophy, who wrote "several noble books" at the request of King Robert of Naples, Villani adds that Dino "was a great cause of Cecco's death, attacking as erroneous the book from which he had lectured at Bologna; and many said that he did this through envy."[2] Padre Appiani, a Jesuit who wrote an apology for Cecco in the seventeenth century, attributed his persecution at Bologna to the father, Tommaso del Garbo, and that at Florence to Dino.[3] Tiraboschi in the eighteenth century came to the conclusion that "envy had no small part in the condemnation of this unhappy astrologer, and that he would not have perished so wretchedly if he had not had powerful enemies who conspired to his ruin."[4] Nothing is said by Villani of Cecco's having offended the duke of Florence, Charles of Calabria, and so forfeited his favor and protection, but this would seem likely, though of course it would account only for his second sentence at Florence.

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[1] *Alcabizzo*, p. 16, "sicut silogizabit quidam noster medicus exculanus cum matre sua fatua sicut ipse." If the reading were "patre suo fatuus," one might be tempted to try to see in it a reference to Dino del Garbo and his father, Tommaso del Garbo.

[2] Villani, X, 40.

[3] Cited by Castelli; I have not seen the work.

[4] Tiraboschi (1775), V, 165.

His execution of little significance.

The condemnation of Cecco, therefore, may be a good example of the way in which the Inquisition could be manipulated for private ends, but it does not seem a sign of any general attack by the church and Inquisition on astrology or on learned men who showed an interest in occult science. The charges repeated, or invented, against Cecco by Villani and the late manuscripts are loose and exaggerated. Why Cecco d'Ascoli was burned at the stake is a problem that has puzzled more than one investigator, and none of the explanations offered is entirely satisfactory. It is, however, fairly evident that the process against Cecco was a failure as an attempt to check his teachings and simply advertised him and his writings. It came late in the medieval period and apparently was not soon repeated. Everything tends to indicate that his execution was an exceptional and sensational, but not especially significant event. The attitudes toward astrology of Thomas Aquinas, whom the church canonized, and of Albertus Magnus, who was beatified, are much more important and more characteristic of medieval ecclesiastical culture.

CHAPTER LXXII

CONCLUSION

The end of our period—Science not stagnant during it—Nor a mere handmaid of religion—The belief in occult virtue—Dominance of astrology—Definition of magic—Difficulty of reducing magic to one principle—Human fondness for the fallacious—Utility is not magic's strongest appeal—The spirit of magic is not the scientific spirit—Magic and experimental science—Science is a gradual evolution, not a modern creation—Its medieval stage of development—Does magic survive in modern learning?—Or in other sides of present life?—Importance of the history of experimental science—Prominence of magic in the history of science—How the human mind works—Indestructibility of thought.

The end of our period.

OUR survey of some thirteen centuries of thought draws to a close. As has been said in discussing Peter of Abano, the period of the medieval revival of learning, as of other phases of civilization, seems to have spent its force by the close of the first quarter of the fourteenth century. On the other hand, the works which we have studied were reproduced again and again in manuscript form in the fourteenth and fifteenth centuries and then in printed form in the fifteenth and sixteenth centuries, as has been pointed out in many instances. Some topics, like that of experimental books, we have traced on as late as into the seventeenth century. In short, the conceptions whose prevalence we have depicted in some detail for thirteen centuries of thought continued to have weight for a long time thereafter. On the occult and magical side, moreover, later writers like Henry Cornelius Agrippa, Trithemius, or Cardan were to add little or nothing to what had been often repeated before. In the field of experimental science, on the other hand, a period of greater progress came later. Gradually, too,—very gradually it would seem until almost our own time—scepticism was to come to prevail among scientists as to the possibility of magic in any of its forms in the world of nature. A great task still awaits him who shall trace the slow rise of effective scepticism through such writings against astrology as those of Nicholas Oresme in the fourteenth, and Pico della Mirandola, who at the same time believed in magic, in the fifteenth century, and in such criticisms of pseudo-science in general as Sir Thomas Browne's *History of Vulgar Errors* in the seventeenth century;[1] and likewise the gradual dislodgment of the conception of occult virtue and influence by that of natural law through the disclosure of many of nature's former secrets by scientific instruments and research.

Science not stagnant during it.

However, the disclosure of such secrets had already begun when the period of our investigation opened and it continued during our period of thirteen centuries, which was no such age of retrogression or stagnation as it has formerly been depicted. The ideas and discoveries of Hellenic, not to say oriental, science persisted and were preserved by medieval men to a greater extent than has been generally recognized; and to them the medieval men added questions, observations, and even discoveries of their own. Not only did curiosity concerning nature's secrets continue, but the authority of the ancients was often received with scepticism; and a marked tendency runs through our period to rely upon rationalism and experimental method. I have exposed the *Physiologus* myth, the *Florilegia* myth, the legend of Roger Bacon as a lone herald of modern experimental science, the notion that Vincent of Beauvais adequately sums up all medieval science, and a number of other modern "vulgar errors" concerning medieval learning. I have shown that medieval men were wider readers than has often been thought, that the scholastics presented their material in a more systematic way than classical writers, that the Latin of the thirteenth century has a clearer style and shows more direct thinking than the vernaculars of the fifteenth century. Should we, moreover, go on to examine in detail the writings of the early modern centuries, I suspect that we would find them repeating the medieval authors just as these had repeated the classical authorities. Gesner, for instance, in his *History of Animals,* 1551-1587, copied Albertus Magnus as well as Aristotle. And of the scientific notions with which the men of the sixteenth century have been credited by their admirers many might be found on closer scrutiny and comparison to date back to classical or medieval authors.

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[1] On Nicolas Oresme, Bishop of Lisieux, see Francis Meunier, *Essai sur la vie et les ouvrages de Nicole Oresme,* Paris, 1857, where many treatises by him against astrology are listed, and Charles Jourdain (1888), pp. 559-587, *Nicholas Oresme et les astrologues de la cour de Charles V*.

In Sloane 2156, 15th century, fols. 209v-224, I have read a treatise by Oresme which Jourdain does not mention, namely, *Contra conjunctionistas de futurorum eventibus,* copied in 1430. In BN 10271, fols. 63-153, is a defense of astrology against Oresme's criticisms by John Lauratius de Fundis, writing at Bologna in 1451.

For Pico's twelve books against astrology, his twenty-six conclusions concerning magic, and his *Apology,* in which he again defends natural magic, see his works as published at Venice in 1519 or 1557. He accepts the church's condemnation of magic as usually practiced, but upholds natural magic. A preliminary paragraph of praise in these printed editions credits Pico with having destroyed astrology root and branch, whereas after previous attacks it had sprung up again, but this is exaggerated praise in view of the later favorable attitude toward astrology of such distinguished astronomers as Kepler and Tycho Brahe, or rather, it shows that the "astrology" attacked by Pico did not comprise everything that we should classify under that head. Pico's attack, such as it was, was countered by Lucius Bellantius in a defense of astrology published in 1502: *Defensio astrologiae contra Ioannem Picum Mirandulam Lucii Bellantii Senensis Mathematici ac Physici Liber de Astrologica Veritate et in Disputationes Ioannis Pici Adversus Astrologos Responsiones. . . . Venetiis per Bernardinum Venetum de Vitalibus Anno a natali Christiano Mcccccii.*

I have read Browne's *Pseudodoxia Epidemica,* which was finished in 1646, in an edition of 1650.

Nor a mere handmaid of religion.

Nor can I agree that natural science in the middle ages, as has been said of medieval philosophy, was a mere handmaid of religion. Friar Bacon pointed out, it is true, how experimental science might serve the Church, but he also wished the Church to advance the study of science. And in many ways the Church did so, while its opposition to scientific research at that time has been grossly exaggerated. It is true that the Biblical and Christian conception of a created universe was generally accepted, but the Aristotelian and astrological conception of the heavenly bodies as eternal and incorruptible was scarcely less influential, and many writers held both conceptions, however inconsistent this may seem to us. We have met with some extreme instances of the religious point of view affecting the attitude toward nature, notably the idea that human sin affects or even upsets the course of nature; but we have also seen that the moralizing and allegorizing supposed to characterize medieval nature-study have been greatly over-estimated. For ancient pagans like Pliny and Seneca the study of nature seems to have taken the place of religion in large measure, but the introduction of Christianity did not result in the discontinuance or estoppal of the study of nature, nor in its reduction to a state of servitude. Medieval science was somewhat under the wing of the Church, as were so many other activities now purely secular, but science even in the middle ages was learning to use its own wings. Both in Mohammedan and Christian society profane learning in general and science in particular made progress, and the remains of Arabic science would be much scantier than they are, were it not for the fact that many works are preserved solely in Latin translations.

The belief in occult virtue.

But many secrets of nature still remained undiscovered in our period, and hence it is not surprising that the conception of occult virtue in nature, of occult influence exerted by animals, herbs, and gems, or by stars and spirits, still prevailed to such an extent among men of the highest scientific attainments then possible. How potent this conception was, has been shown by the continued use of amulets, of ligatures and suspensions, by the general belief in fascination, physiognomy, number mysticism, and divination from dreams. Some still countenanced the occult force of words, figures, characters, and images, or of this and that rite, ceremonial, and form. Especially surprising is the prevalence of lot-casting under the pseudo-scientific form of geomancy. But others had begun to doubt the efficacy of some or most of these things. Animism had pretty much had its day; necromancy and the notory art received relatively little attention, although the Church appears to have rather encouraged them by insisting upon the existence and power of evil spirits. But even the fathers and theologians made the point that demons work their marvels largely through their superior knowledge of natural forces. Much more in science and medicine have we seen the notion of spiritual force displaced by that of occult natural virtue, and use made of natural substances rather than of incantations. Some of our authors would explain the results achieved by incantations entirely by the force of suggestion. Of the later witchcraft delusion which overpowered the learned as well as the populace we have found relatively few harbingers. The discussion of sorcery and witchcraft has been less in our medieval than in our ancient authors, and less among our scientists than among our theologians. The subject has been broached chiefly in connection with formal definitions of magic arts or the practical problem of impotency after marriage.

Dominance of astrology.

We have also repeatedly seen magic itself becoming more scientific or pseudo-scientific in method and appearance. This is well illustrated by the fact that in our authors of the twelfth and thirteenth centuries astrology is the most widespread, as it is the most pseudo-scientific of any variety of the magic arts. Indeed, it has ceased to be merely one method of divination and claims to study and disclose the universal law of nature in the rule of the stars, by which every fact in nature and every occult influence in magic may be explained. If this doctrine were true, all other sciences and magic arts would be reduced to branches of the supreme science and art of astronomy or astrology. But it is not true, and hence I prefer to classify astrology as a magic art along with other arts of divination. And this brings us back to the question of the definition of magic.

The results of this investigation seem to me to have justified the selection of the word, "magic," as a generic

Definition of magic.

term to include all superstitious arts and occult sciences, and to designate a great primary division or phase of human thought and activity. Magic is subordinate to no other superstition or occult art; they are more often regarded as subdivisions of it. The attempts of some of our authors to distinguish between magic and astrology, or magic and divination, or good and bad magic, or natural magic and sorcery, or witchcraft and counter-magic, have all been exceedingly illogical and unconvincing. Magic appears, in our period at least, as a way of looking at the world which is reflected in a human art or group of arts employing varied materials in varied rites, often fantastic, to work a great variety of marvelous results, which offer man a release from his physical, social, and intellectual limitations, not by the imaginative and sentimental methods of music, melodrama, fiction, and romance, or by religious experience or asceticism, but by operations supposed to be efficacious here in the world of external reality. Some writers, chiefly theologians, lay great stress on resort to spirits in magic, some upon the influence of the heavens, some on both these forces, which yet others almost identify; but, except as theological dogma insists upon the demoniacal character of magic, or as astrological doctrine insists on the rule of the stars, it cannot be said that spirits or stars are thought of as always necessary in magic. The *sine qua non* seems to be a human operator, materials, rites, and an aim that borders on the impossible, either in itself, such as predicting the future or curing incurable diseases or becoming invisible, or in relation to the apparently inadequate means employed.

Difficulty of reducing magic to one principle.

In our authors it has been difficult to account for the particular occult properties attributed to things and acts, or to detect any one underlying principle, such as sympathy, symbolism, imitation, contagion, resemblance, or association, guiding the selection of materials and rites for magic. This is either because there never was such a principle, and magic from the start was empirical and complex, or because we deal with a late stage in its development, when the superstitions of different peoples have coalesced, when the peculiar customs of folk-lore have become confused with those of science and religion, after the primitive methods of magic have been artificially over-elaborated, and after many usages have become gradually corrupted and their original meaning has been forgotten. Whether magic is good or evil, true or false, is with our authors a matter of opinion, in which the majority hold it to be true but evil. Every shade of opinion is represented, however; but furthermore few can avoid a wholesome feeling that there is something false about magic somewhere. This sounds the signal, as it were, for magic's doom.

Human fondness for the fallacious.

However, I suspect that it is not so much that magic has been shown to be false, as it is that men have come to set a greater value upon truth, that accounts for magic's decline. As I survey the practice and "beliefs" of primitive and savage tribes or the columns of modern newspapers and much of modern literature, I become convinced that men have a natural tendency to assert, and craving to hear the sensational, exaggerated, and impossible, and to fly in the face both of reason and experience. People take pleasure in affirming the extravagant and in believing the incredible, in saying that they have seen or done what no one else has seen or done. Cows, for instance, seldom or never burst, as everyone knows perfectly well, primitive man probably better than civilized; that is what makes it interesting to mention circumstances under which they will burst. "Lord, I believe, help Thou my unbelief," is a good picture of the mental attitude supporting much of magic, which may be not so much a matter of belief as of make-believe.

Utility is not magic's strongest appeal.

To turn from "belief" to practice, I suspect that much magic is done from want of anything better or else to do, rather than from complete conviction of its efficacy. When Pamphile in the pages of Apuleius anointed herself from top to toe in order to turn into an owl, it was because this was the best way of which she could think to enable herself to fly far, far away. But had an airplane been at hand, I fancy she would have had more confidence in it for purposes of flight. Inventions in artificial lighting have probably done more than sermons, arguments, and laws to dispel the works of darkness with which magicians whiled away the night-time. Had electric light been invented in Pamphile's age, she would probably have spent her evenings in jazz or at a movie. It was probably not during the hunting season that cave-men drew their magic pictures of wild boars and bulls. The telepathy practiced by savages in war and hunting[1] is perhaps less from firm faith in its potency than because the women left at home want to do something and to share somehow in the crucial operations, and furthermore are expected "to do their bit" by the men in the field. Perhaps such telepathic magic had almost as great actual efficacy toward its end as some of the desperate expedients, prompted more by patriotic emotion than discreet calculation, which were adopted to help "win the war" or to "maintain morale" by those who stayed at home during the recent great conflict. I should doubt if most men ever believed that rain falls only as a result of magic. It seems more likely that they are aware that the rain will come some time, and hence are ready to do almost anything which may hurry it up or relieve their own feelings and inaction in the meantime. As no modern scientist has brought to their attention any more efficacious method of altering the weather, they continue their time-honored rite regardless of our jeers. It does as well as any. But where some prehistoric genius introduced artificial irrigation, rain-making magic probably promptly declined in popularity.

The spirit of magic is not the scientific spirit.

In the case of rain-making there is evidently much truth in Sir James Frazer's statement that "the fallacy of magic is not easy to detect, because nature herself generally produces sooner or later the effects which the magician fancies he produces by his art."[2] But the dictum cannot be stretched to cover magic in general. In some cases the fallacy of magic is all too evident, but men love it, or there is as yet no truth discovered to take its place. Rational scepticism is needed to dispel the former; repeated experiment, to arrive at the latter. Believers in and practitioners of magic probably at no time in its history either even flattered themselves on so sound a basis of theory, or were so severely practical in their aims and methods, as not to delight in the marvelous and incredible and impossible for their own sake. Rather in providing or attempting to provide for practical wants and emergencies, considerations of credibility and possibility often were apt to be cast to the winds. Thus the spirit of magic is different from the scientific spirit.

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[1] J. G. Frazer (1911), I, 119-26.

[2] J. G. Frazer (1911), I, 242.

Magic and experimental science

Yet our material has conclusively shown that the history of magic is bound up with the history of science as well as with folk-lore, primitive culture, and the history of religion. Sometimes our authors have spoken of natural magic, but I rather wonder whether there could well be any other kind, since man must always reckon with his natural environment. It is not without reason that the Magi stand out in Pliny's pages not as mere sorcerers or enchanters but as those who have gone farthest and in most detail—too curiously, in his opinion—into the study of nature. It is not without reason that we have found experimentation and magic so constantly associated throughout our period. After all it is not surprising that magic, which was both curious and tried to accomplish things, should investigate nature and should experiment. It is even possible that magicians were the first to experiment, or shared that province with the first inventors and the useful arts, and that natural science, originally philosophical and speculative, took over experimental method in a crude form, as well as the conception of occult virtue, from magic. As Sir James Frazer has said, "Here is a body of men relieved, at least in the higher stages of savagery, from the need of earning their livelihood by hard manual toil, and allowed, nay, expected and encouraged, to prosecute researches into the secret ways of nature."[1] It is therefore perhaps not surprising that men like Galen, Apuleius, Apollonius, and Dunstan were accused of magic by their contemporaries; that men like Gerbert, Michael Scot, and Albertus Magnus were represented as magicians in later, if not contemporary legend; that *Lithica* and Roger Bacon tell us of the danger of sages being accused of magic; that the *Book of Enoch*, Cyprian, Firmicus, and Picatrix confuse magic with other arts and sciences; and that no one of our authors, try as he may, succeeds in keeping magic entirely out of science or science entirely out of magic.

Science is a gradual evolution, not a modern creation.

Be that as it may, if the anthropologists are correct in asserting that magic forms a great part of the life and thought of early man and of all primitive peoples, it is evident that only gradually would the science and thought of civilized peoples free themselves from the old habits and instincts. Modern science cannot exempt itself from its own theory of evolution as Julius Firmicus exempted the Roman emperor from the rule of the stars. Science did not come down from above nor invade from without. It grew up in the very midst of superstition and mental anarchy, just as the states of modern Europe had their beginnings in feudal society. As the kings in the middle ages had to govern under feudal limitations and even by feudal means, so science for a long time not merely was opposed by the unscientific attitude, but was itself tinged by fantastic theories and false data. It is scarcely a paradox to say that during our Roman and medieval period the laws of magic were better defined and understood than those of science. Yet the scientific attitude, like the spirit of nationality, was at work in the seeming chaos; gradually it shook itself free from error, and, by the increasing application of truly scientific methods, won a similar triumph to that which the sovereign political power gained by its gradual development of governmental institutions.

This was the process going on in the twelfth and thirteenth centuries. When men still believed in demons and witches and divination from dreams, it is not surprising that they believed also in natural magic. Only a small part of nature's secrets were revealed to them; of the rest they felt that almost anything might turn out to be true. It was a time when "one vast realm of wonder spreads around." They had to struggle against a huge burden of error and superstition which Greece and Rome and the Arabs handed down to them; yet they must try to assimilate what was of value in Aristotle, Galen, Pliny, Ptolemy, and the rest. Crude naïve beginners they were in many respects. Yet they show an interest in nature and its problems; they are drawing the line between science and religion; they make some progress in mathematics, geography, physics and chemistry; they not only talk about experimental method, they actually make some inventions and discoveries of use in the future advance of science. Moreover, they themselves feel that they are making progress. They do not hesitate to disagree with their ancient authorities, when they know something better. Roger Bacon affirms that many scientific facts and truths are known in his time of which Plato and Aristotle, Hippocrates and Galen, were ignorant. The ancients, says Peter of Spain in effect, were philosophers, but we are experimenters. Magic still lingers but the march of modern science has begun.

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[1] J. G. Frazer (1911), I, 246-7.

Its medieval stage of development.

Are there other sides of our life and thought to-day where magic still lingers and no such march as that of modern natural and experimental science has been begun or progressed so far? We fear that there are. One can well imagine that a future age may regard much of the learning even of our time as almost as futile, superstitious, fantastic in method, and irrelevant to the ends sought, as were primitive man's methods of producing rain, Egyptian amulets to cure disease, or medieval blood-letting according to the phases of the moon. Ptolemy believed in astrology, but how many archaeologists and philologists and students of early religion and mythology and folk-lore there are who fail to observe his great law that one should always adopt the simplest possi-

Does magic survive in modern learning?

ble hypothesis consistent with the observed facts! How some ransack the latest and remotest sources for some one brief annotation by a scholiast that may support some ingenious theory concerning the earliest origins of a language, a cult, or a deity,—which theory too often has only this to recommend it, that no one has ever thought of it before! How to prove a point concerning some single country and restricted period they bring together word-forms, coins, fragments of vases, customs, and folk-tales from the most outlandish regions and widely separated eras, and pile up a huge collection of most erudite looking footnotes, full of abbreviated formulae denoting German periodicals which have all the appearance of the unintelligible jargon of some ancient incantation! As one reflects upon the respect and admiration with which such "scholarship" and "research" is regarded by many in our own time, can one wonder that in the middle ages and antiquity the pharmacist who added to his compound herb after herb from India and other romantic lands, or part after part from the carcasses of fabulous animals, in a frantic effort to improve upon a remedy that was wrong to start with,—can one wonder if he was hailed in his day as a discoverer and public benefactor, if his compound was copied in book after book and century after century, and, while he perhaps had devised it against some one ailment, if it came in time to be regarded as a panacea for all ills? How many historical generalizations, which originated in superficial association of ideas on no sounder a basis than that supposed by some to lie behind magic, are not only still current, but are glibly and unquestioningly assumed as themselves a basis for what might otherwise be considered truly scientific investigation of more detailed and less important points!

Or in other sides of present life?

We might carry our comparison from the world of scholarship, which at least displays industry and ingenuity in its superstitions, to the cruder and lazier conceptions and assumptions of social and civil life. Often enough has the connection of religion with magic been pointed out, but what side of life is there that is free from it? If not sheer intolerance, what else than survivals or revivals of ritual are all those conventions of dress and etiquette which are supposed to distinguish ladies and gentlemen from their fellow human beings? "Good form" is one of the last lines of trenches by which stupidity endeavors to hold its conquest or inheritance or—shall we say?—native soil of respectability. And how much we are forced to hear of literary or of social charm! Is such charm any less fleeting and fallacious than the magic charm from which it takes its name? Does it advance truth or retard civilization? Is not the man without it, who has to be twice as efficient in order to secure the same position as the man with it, the true builder? Does such personal charm add any more to its possessor's real value to society than the incantation of the ancient artisan did to his industrial process? We believe that it does, but so did he. Or who can marvel at past belief in the magic power of words, who hears statesmen speak and millions shout of Militarism, Unconditional Surrender, Nationality, Democracy, Prohibition, Socialism, and Bolsheviki? What fears, what hopes, what passions, what prejudices, what sacrifices these words elicit! And how little agreement there is as to their meaning! If our illustrations are somewhat frivolous and superficial, let us measure the amount of magic in present civilization by Plotinus' standard. He who yields to the charms of love and family affection or seeks political power or aught else than Truth and true beauty, or even he who searches for beauty in inferior things; he who is deceived by appearances, he who follows irrational inclinations, is as truly bewitched as if he were the victim of magic and *goetia* so-called. The life of reason is alone free from magic. Measuring our age by such a standard, we shall be tempted to cry out, Magic of magics, all is magic! What else is there to write about?

At least one thing, and that is experimental science. "It always is making acquisitions and never grows less; it

Importance of the history of experimental science.

ever elevates and never degenerates; it is always clear and never conceals itself." Of its relations to magic through some thirteen centuries of thought I have deemed it worth while to attempt a somewhat detailed picture in the foregoing pages, presenting not only a survey of occult science but of the lives and writings of some pioneers, now too forgotten, in science's earlier and less successful days. Originally magic alone was the object of my investigation, and experimental science an unexpected by-product which forced its importance during our period increasingly upon the attention. For this reason, while the magic of the learned has perhaps been treated here about as fully as it deserves, a complete and thorough history of experimental science through these thirteen centuries has not been attempted, and much new material in all probability still awaits discovery in the period of which we have treated. And while I have not yet had time to do much reading in works of the fourteenth and fifteenth centuries, I suspect that while the writers on occult subjects have little or nothing new to say, experimentation probably continued its evolution and that there may even be disclosed in obscure writers of that time germs of some of the discoveries usually ascribed to later and greater names.

Prominence of magic in the history of science.

On the other hand, I have found little to suggest that medieval men themselves purposely concealed scientific discoveries which they had made, although it is true that some of them believed that the ancients had done this, and although some of them pretended to do so themselves. Above all I have demonstrated that when ancient or medieval authors are apparently superstitious, they are really so, and that it is far-fetched to attempt to explain such passages as cryptograms or allegories or flights of poetical imagination or interpolations or signs of spurious authorship. Our authors do not intentionally employ occult science to hide truths of natural science or inventions in applied science. Rather it is characteristic of magic and occult science to make a pretense of hidden truth and of marvel-working which they cannot substantiate. And the fact concerning our authors has been that they cannot yet consistently discriminate between occult science and natural science, between magic and applied science.

How the human mind works.

If this investigation has shed some light on the biographies and bibliography of past scholars and scientists, on the textual history and criticism of particular works or the general condition of the manuscript material, perhaps it has also supplied data that may prove of value to philosophers and psychologists in determining the laws of human thought and our intellectual processes. Instead, say, of giving a so-called intelligence test to some hundreds of immature school children to discover which ones are well-nigh imbecile or idiotic, I have set forth for comparison the mature, carefully considered thoughts on certain topics of a number of the world's intellectual leaders through centuries. We have seen the same old ideas continually recurring,[1] new ideas appearing with exceeding slowness, men of the same given period holding a common stock of notions and being for the most part in remarkable agreement. Even the most intellectual men seem to have a limited number of ideas, just as humanity has a limited number of domesticated animals. Not only is man unable by taking thought to add one cubit to his stature, he usually equally fails to add one new idea to humanity's small collection. Often men seem to be repeating the ideas like parrots. And this is not merely patristic, or scholastic; it is everlastingly human. Yet it has been evident that some of our authors were more original, resourceful, ingenious, inquisitive than others. There is curiosity, occasionally a new question is asked, an old thought put in a novel way, or a new experiment tried.

Indestructibility of thought.

As I have pursued this investigation, my wonder has grown at the number of learned men of whom memory has been preserved from a distant past even to our day, at the voluminousness of their extant writings, at the many small details of their daily life which are known to us. Sometimes their respective lives and thoughts intertwine and cross and coincide so that a learned world and society seems to stand out entire. Moreover, what might be found out concerning them by exhausting the manuscript material would doubtless be much greater than scholars have as yet established. At any rate the records are abundant, more so than for any other phase of human life except perhaps art; they permit of detailed examination; no severed fragments or dead bones, they throb with life. Some species may lay more eggs, or multiply more rapidly, but manuscripts survive. Neckam's book has withstood the worms better than its master, but he, too, still lives in and through it and his other books. If matter is indestructible and energy is conserved, may we not paraphrase Adelard of Bath and say in closing: "And certainly in my judgment nothing in this world of thought ever perishes utterly, or is less to-day than when it was created. If any concept is dissolved from one union, it does not perish but is joined to some other group." Magic and experiment yesterday; science and experiment to-day. Long live Thought! and may it some day regroup itself into Truth!

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[1] Sometimes I have called attention to such parallel passages in the text, but an examination of the index will reveal others.

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